MANUAL

SIMRAD AP35

Autopilot

22083083K Sw.V1R4 English

Instruction Manual

This manual is intended as a reference guide for operating and correctly installing the Simrad AP35 autopilot.

Great care has been paid to simplify operation and set-up of the AP35, however, an autopilot is a complex electronic system. It is affected by sea conditions, speed of the vessel, hull shape and size.

Please take time to read this manual to get a thorough understanding of the operation and system components and their relationship to a complete AP35 autopilot system.

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F Following corrections: STBY button section 2.3. Conductor color on figure 4-19. HDM message on page 83. Added FU35 under Comm. Failure alarm page 95.

G Minor corrections in text on page 58, 83 and 85. Distributor list updated.

H Updated according to software version V1R4. RFC35R substituted by RC25. FU35 substituted by FU50. Modifications on RF45X.

I CI300X substituted by GI51 Gyro Interface.

J Alternative connection for GI51 added, page 67. S1 removed on figure 4-5.

K Spare parts list updated.

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1 GENERAL INFORMATION

1.1 Introduction

Congratulations on the purchase of your new Simrad AP35 autopilot system and thank you for selecting what we feel is the most advanced autopilot system available on the market today.

Today Simrad manufacture a complete range of autopilots for all types of vessels, from leisure boats up to advanced steering systems for merchant marine vessels. Our factory for these products is located in Egersund on the south/west coast of Norway. The company's involvement in autopilots began in 1953 with equipment for the North Sea fishing fleet under the brand name Robertson. Professional mariners around the world acknowledge that the Robertson and Simrad brand names are synonymous with the absolute best in autopilot technology.

The AP35 autopilot from Simrad represents yet another step forward in autopilot technology with the intent to provide small fishing boats and work boats up to 45 feet with a host of new features. The system can be expanded and enhanced with a selection of options and accessories.

The brain in the AP35 autopilot system is the single "intelligent" junction unit that communicates with all other system modules on the ROBNET network. The ROBNET has been developed to establish a reliable digital communication and power distribution network between the units in the system. The ROBNET simplifies installation and enables the AP35 system to be easily expanded at any time. Any unit that is connected to the autopilot system via Robnet is called a Robnet Unit (See table on page 9).

1.2 How to use this manual

This manual is intended as a reference guide for operating, installing and maintaining the Simrad AP35 autopilot. Great care has been paid to simplify operation and set-up of the AP35, however, an autopilot is a complex electronic system. It is affected by sea conditions, speed of the vessel, hull shape and size.

Please take time to read this manual to get a thorough understanding of the operation and system components and their relationship to a complete AP35 autopilot system.

Other documentation materials that are provided with your system include a warranty card. This must be filled out by the authorized dealer that performed the installation and mailed in to activate the warranty.

1.3 System components

A basic AP35 system consists of the following units (refer to Figure 1-1):

- AP35 Control Unit with accessories
- Heading sensor
- Rudder Feedback Unit with transmission link
- Junction Unit
- Drive unit

The basic system can be expanded with remote control unit, hand held remote and steering lever.

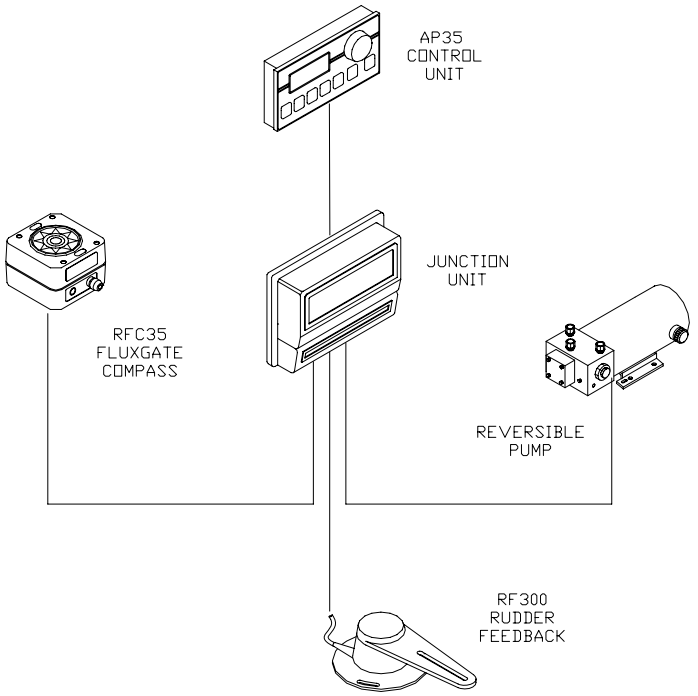

Figure 1-1 AP35 Basic system

1.4 AP35 Control Unit

A compact autopilot control for panel, bulkhead or bracket mounting. Large LCD display for readout of autopilot data and rotary course selector. It has two Robnet connectors for system inter- connection and expansion.

1.5 Junction units

The junction unit is the central in the AP35 autopilot system. It contains the steering computer, interface circuits to all system components and drive circuits for the drive unit motor and clutch. Three models, J300X, J300X-40 and J3000X are available.

Junction unit comparison chart:

	J3000X	J300X (J300X-40)
Supply voltage	10-28 V	10-40 V
Motor current (continuous/peak)	6/12 A	10/20A (20/40A)
Number of Robnet units* (+J3xx)	2	5
NMEA ports (input/output)	1	2
Solenoid output	x	x
Input for NFU control	x	x
External alarm		x
Radar clock/data interface		x

* AP35 Control Unit, RC25 Rate Compass, FU50 Follow-up lever, GI51 Gyro Interface, NI300X NMEA Interface.

1.6 Rudder Feedback units

RF300 Rudder Feedback Unit

Rudder feedback unit with transmission link and 10 m (30 feet) of cable. Transforms the angular travel of the rudder to a digital signal read by the autopilot steering computer.

RF45X Rudder Feedback Unit

This unit transmits two electrical signals proportional to the rudder angle. One signal operates as a feedback for the autopilot, the other as drive signal for rudder angle indicators. The unit is mounted close to the rudder stock and is mechanically connected to the rudder by the RF45 Transmission link.

1.7 Heading Sensors

The AP35 autopilot can be used with the following combinations of heading sensors:

RFC35 Electronic Fluxgate Compass

A compact heading sensor from Simrad with 15 m (45 feet) of cable. The direction of the earth's magnetic field is sensed by a floating ring core in a fluxgate coil and transformed to a digital signal read by the autopilot steering computer.

RC25 Rate Compass

Fluxgate compass with integrated rate of turn sensor. Provides a dramatic improvement to the dynamic performance of both the autopilot and a stabilized radar display.

Same dimensions as RFC35.

Magnetic Compass

Most liquid filled magnetic compass with external 2 axis gimbals can be interfaced by using CD100A (CD109) Course Detector and CDI35 Course Detector Interface. The AP35 provides excitation current for CD100A and converts the analogue sin/cos signal to digital two wire format for the autopilot steering computer.

GPS Compass

- HS50 Heading Sensor connects directly to NMEA port #2 in J300X and J300X-40 using NMEA 0183 HDT message.
- Any other GPS compass with NMEA 0183 HDT message (Furuno, JRC) connects directly to NMEA port #2 in J300X and J300X-40.

Gyro Compass

- Gyrocompasses with 1:1 ratio synchro output may be interfaced by using the GI51 Gyro Interface. GI51 is connected to the AP35 by Robnet.
- Gyrocompasses with NMEA 0183, HDT output may be connected directly to NMEA port #2 in J300X and J300X-40.

Note ! *Gyro compasses with stepper or geared synchro output can not be interfaced to AP35/GI51.*

1.8 Optional equipment

A series of options are available for the basic AP35 system.

R3000X Remote Control

A small handheld remote control with two push buttons for power steering or course selection (port and starboard), and one push button with built-in lighted indicator for mode selection.

S35 NFU Steering Lever

S35 is designed for indoor and outdoor bulkhead mount and made of shock resistant polyxymethylene. The lever has spring loaded return to mid-position. A push button with light indicator is used for mode selection when connected to a Simrad J3XX junction unit.

FU50 Follow-Up Steering Lever

The FU50 Follow-up steering lever features a dial (scale) with 5° rudder angle markings. The rudder will move and stop at the angle selected on the dial. The FU50 has a mid-position indent, buttons for (limited) mode selection, and mode indicators (STBY, FU, AUTO, NAV, WORK, and THRUSTER*). It is designed for indoor and outdoor bulkhead- or panel-mounting. Refer to the FU50 manual.

* With AP50 Autopilot only.

RI35 Mk2 Rudder Angle Indicator

The RI35 Mk2 is manufactured in non-corrosive aluminum with a non-reflective black finish.

The indicator is made in standard modular size (132x108 mm) to match the Simrad AP35 autopilot.

The instrument gives a continuous reading of the rudder position up to 45 degrees to each side of midship position. A front panel key is used for rudder zero adjustment and illumination adjustment.

The splash proof construction allows panel, bulkhead or bracket mounting in exposed locations, such as bridge wings as well as wheel house and engine room.

Note ! *See Figure 4-1 for illustrations or section 3 for technical specifications.*

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2 OPERATION OF THE AUTOPILOT

Caution ! ***An autopilot is a very useful navigational aid, but DOES NOT under any circumstance replace a human navigator.***

Do not use automatic steering when:

- ***In heavy traffic areas or in narrow waters***
- ***In poor visibility or extreme sea conditions***
- ***In areas where use of autopilot is prohibited by law***

When using an autopilot:

- ***Do not leave the helm unattended***
- ***Do not place any magnetic material or equipment near magnetic or fluxgate compass used in the autopilot system***
- ***Verify at regular intervals course and position of vessel***
- ***Always switch to Standby mode, and reduce speed in due time to avoid hazardous situations***

2.1 Overview

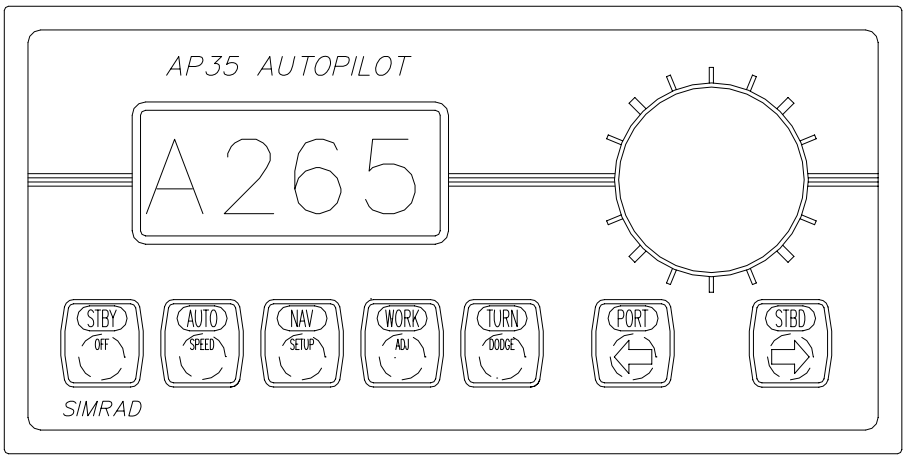


Figure 2-1 AP35 Front Panel

The control unit shown above can operate as a stand alone unit in an autopilot system or combined in a multistation system. In a multistation system the command can easily be transferred from one unit to another. Units not in control will display "Inactive".

The AP35 system is capable of the following primary steering modes: STBY (manual steering), AUTO, NAV, WORK and TURN, each mode having a dedicated push button.

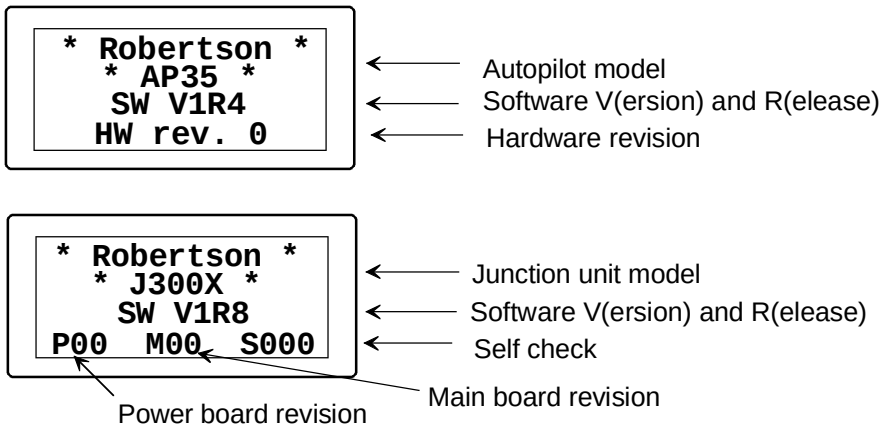
Each of the mode push buttons is clearly identified with the primary function in large text, and a secondary function listed in smaller text. Each button provides you with the ability to access a primary display, a secondary display and/or multiple function displays.

A group of user adjustable settings are provided in the AP35 USER SETUP MENU (page 25). The settings allows adjustment of display visibility, selection of heading sensors, navigation and position sources and the ability to select between automatic or manual adjustable sea state filter.

Alarms are presented in plain text to alert you of system and external data failure conditions. Alarms include both audible and visual presentations. The alarm listing is on page 91.

2.2 ON/OFF - Standby mode

A single press on the STBY button switches the system ON and the following status displays are shown:



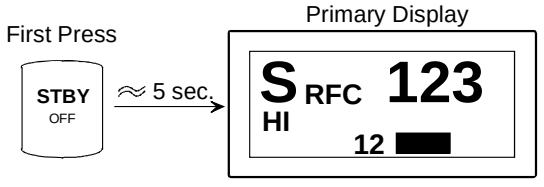
SW and HW revisions shown are examples only

After approx. 5 seconds the system is operative and the unit that was turned on will show the STBY mode Primary Display. Other units in a multistation system will display "Inactive". Control can be available at any unit by pressing the STBY button.

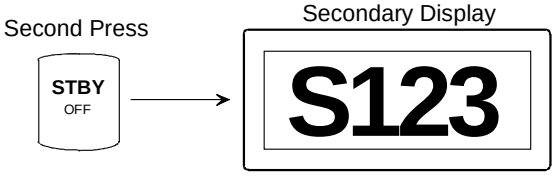
A long press (2-3 sec.) on the STBY button switches the system OFF.

Note ! *In an emergency it is possible on a multistation system to turn OFF the system at any control unit by pressing down the STBY button for 2-3 seconds.*

STBY mode is also the mode that is used when steering the boat manually.



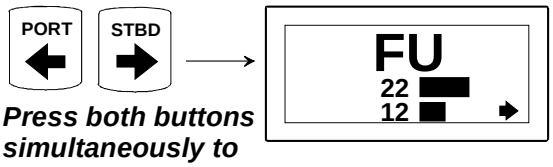
Standby mode.
Current heading from RFC compass.
HI speed selected.
Rudder angle: 12 degrees to starboard.



Standby mode.
Current heading.

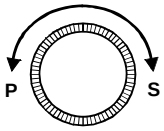
2.3 Follow-Up steering

When both the PORT and STBD push buttons are pressed simultaneously the AP35 is set to Follow-Up steering mode and rudder commands can be set by the course dial. One revolution of the dial equals 45° rudder command. The rudder will move to the commanded angle and stop.



Press both buttons simultaneously to activate Follow-Up

Follow-Up mode.
Commanded rudder angle: 22° to stbd.
Rudder angle:12



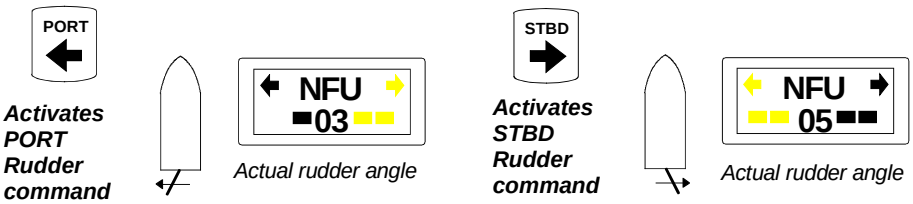
Use course knob to command rudder angle.

Return to manual control in STBY by pressing the STBY button.

WARNING ! *While in Follow-Up mode, you cannot take manual control of the vessel.*

2.4 Non-Follow-Up steering

In STBY mode, when the PORT or STBD push button is pressed separately, the actual rudder angle is shown on the secondary display and the rudder will move as long as the button is pressed.



Activates PORT Rudder command

Actual rudder angle

Activates STBD Rudder command

Actual rudder angle

2.5 NFU Steering lever

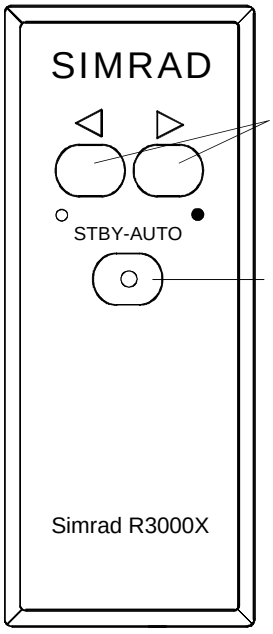
In STBY mode the rudder will move as long as the lever is offset to Port or Starboard

2.6 NFU Push button remote control

In STBY mode the rudder will move as long as the Port or Starboard button is pressed.

Note ! *When a NFU steering lever or remote control is operated, the control unit(s) become "Inactive".*

2.7 R3000X Remote Control


SIMRAD
Push buttons for Port and Stbd NFU commands
STBY-AUTO
STBY/AUTO mode button. AUTO, WORK or NAV mode is when lamp is lit
Simrad R3000X

Note!

When in AUTO/WORK mode, pressing the buttons will change the set course 1° per push. If you keep the button pressed, it will automatically change the course in increments of 3°/second.

Operation of mode button returns the autopilot to initial mode except when in Nav mode:

AUTO → STBY → AUTO
WORK → STBY → WORK
NAV → STBY →AUTO

Nav and Work modes can only be entered from the control unit.

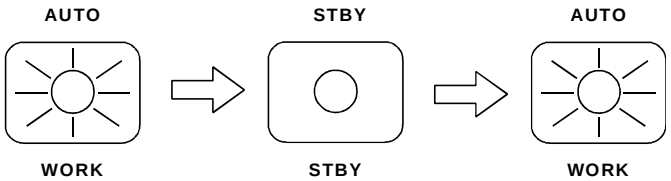
2.8 S35 NFU Steering Lever

STBY: The rudder will move as long as the lever is offset to Port or Stbd (NFU steering). The mode button is lit each time the lever is offset.

AUTO/WORK: The set course will be changed by 3°/sec. when the lever is offset to port or Stbd.

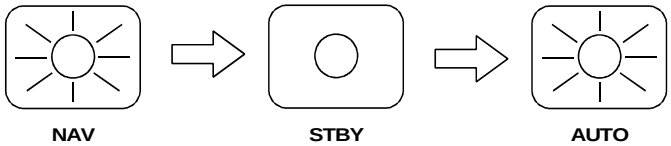
The mode button remains lit as long as the autopilot is in AUTO or WORK mode (and NAV mode).

Mode change sequence is as follows:



Operation of mode button returns the autopilot to initial mode.

NAV: It is not possible to change set course by the lever. Pressing the mode button brings the autopilot to Stby mode, but next press brings it to Auto mode, not back to Nav mode.



Note ! *NAV and WORK mode can only be entered from a control unit.*

2.9 Automatic Steering

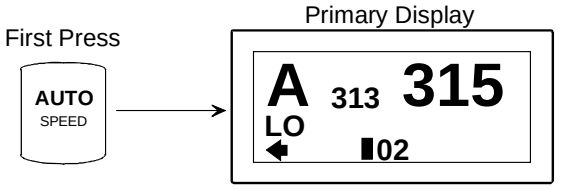
The AUTO mode is used to make the AP35 steer the boat automatically on a set heading. AUTO is always available from any mode or function within the AP35 by a single push on the AUTO button. When the AUTO mode is selected, the AP35 automatically selects the current boat heading as the set course and the current rudder angle to compensate for wind/current.

Note ! *If Init Rudder "Midship" is selected (see Dockside settings, page 71 the rudder will move to midship (0°).*

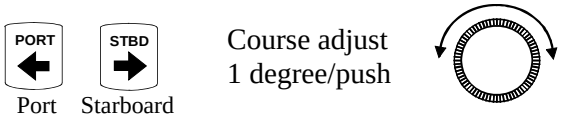
In AUTO, the AP35 is issuing rudder commands to keep the boat on the set heading. Determination of the boat heading is provided by the magnetic compass course detector or RFC35 Fluxgate Compass (or an optional heading sensor) for course keeping in AUTO mode.

The AP35 will keep the boat on the set heading until a new mode is selected or a new heading is set with either the course dial or the PORT or STBD buttons. One revolution of the dial equals 45° course change.

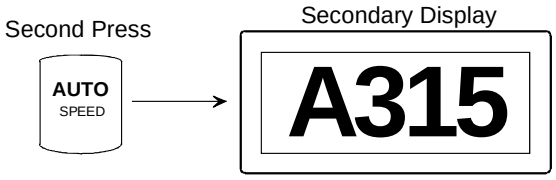
Once the course is changed to a new set heading, the boat will automatically turn to the new heading and continue to steer straight.



Automatic steering mode.
Set heading.
Boat heading.
LO speed selected.
Rudder angle: 02°



Course change
CW: Starboard
CCW: Port



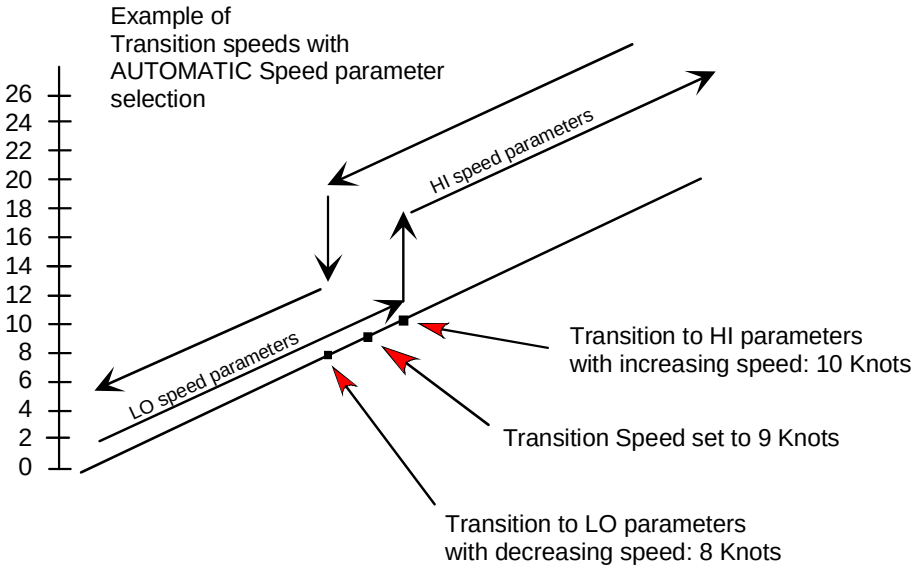
The secondary display is also shown for 3 seconds when the PORT or STBD button, or the course dial is activated from primary display.

2.10 Automatic Speed selection

The AP35 provides two different sets of steering parameters for controlling the response of the boat at different speeds (HI or LO) while in AUTO and NAV modes.

The AP35 always selects the HI speed steering parameters when first switched on. This is a safety feature. After initial turn on, selection of the steering parameters is done automatically, based on the availability of input data from either an external speed log or an external navigator, or manually.

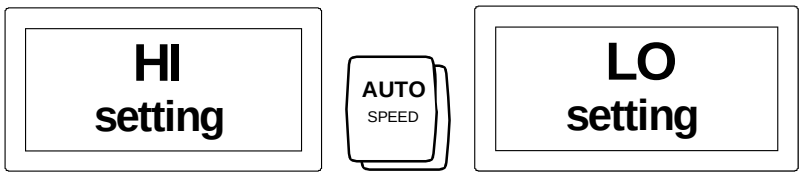
The AP35 automatically selects the HI or LO parameter set. The speed at which the AP35 changes from HI to LO (or opposite) is determined by the "Transition Speed" set in the Installation Setup Menu.



2.11 Manual speed selection

Select AUTO mode. To toggle between HI and LO speed parameters, press the "AUTO" button two times quickly (Double click).

If you change boat speed it is recommended that you select HI or LO parameters correspondingly.



The manually selected steering parameter set (HI or LO) will remain in effect until you re-enter AUTO mode or restarts.

2.12 Navigating with the AP35

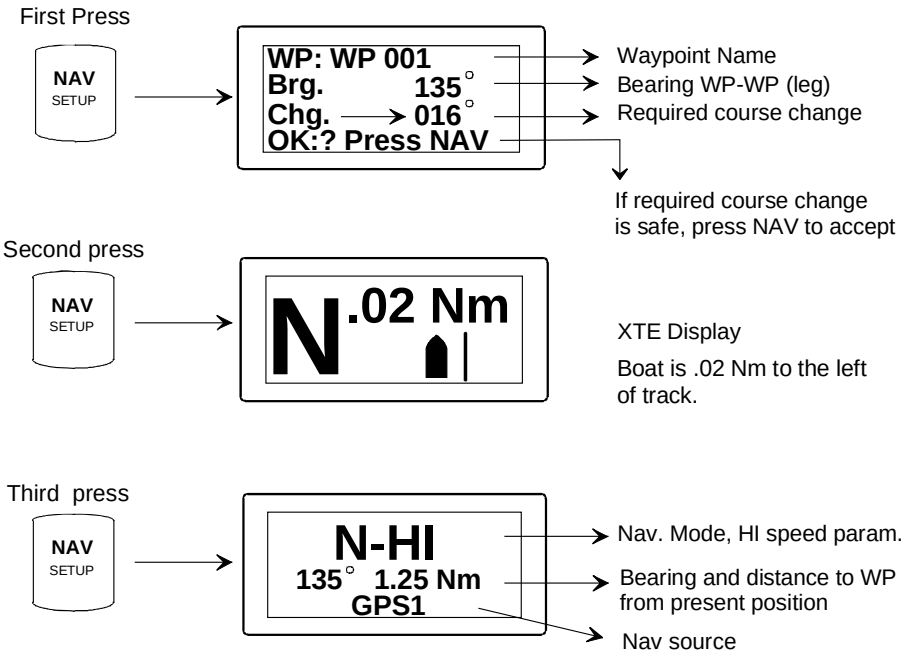
The AP35 has the capability to use steering information from an external navigator (GPS, Chart Plotter) to direct the boat to a specific waypoint location, or through a route of waypoints. In the NAV mode, the AP35 uses the heading sensor as it's source of heading for course keeping. The steering and speed information received from the external navigator alters the set course to direct the AP35 to the destination waypoint.

Note ! *Navigational steering must only be used in open waters. The process of having an external navigation receiver direct an autopilot can be a slow acting process. By selecting the NAV mode, the AP35 is set for automatic steering on the current set course and then waits for the user to accept the course change to the destination waypoint.*

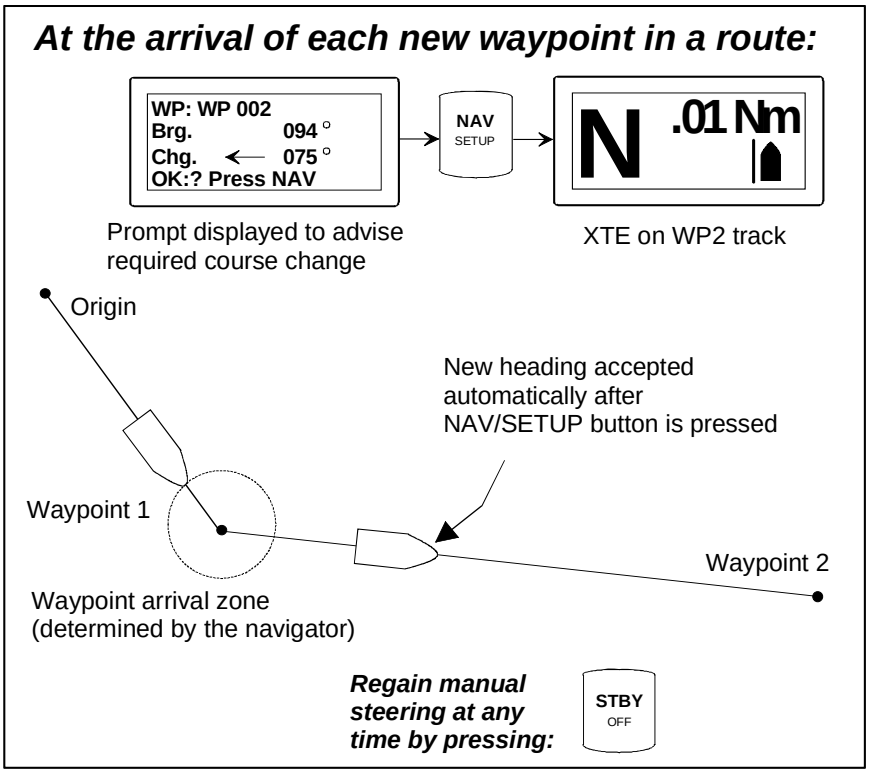
To obtain satisfactory navigation steering, the following points must be fulfilled prior to entering the NAV mode:

- The AP35 autosteering must be tested and found satisfactory.
- The navigation receiver must be operating and the navigation system (GPS, Chart Plotter) must be in full operating mode with adequate signal characteristics for valid position and steering data.
- At least one waypoint must be entered and selected as the current waypoint in the navigation receiver.
- The navigation source in the AP35 USER SETUP menu must be set for the navigator that contains the current waypoint.

The AP35 is designed to steer in “mixed mode” operation. This combines the straight steering capability of cross track error (XTE) steering in conjunction with the turning capability of bearing mode steering (course to steer (CTS)).



When operating the AP35 in NAV mode to automatically steer through a route of waypoints, the AP35 will steer to the first waypoint in the route after you accept the first waypoint as the location to steer to. When you arrive at the waypoint, the AP35 will display an alert screen with the proposed new course information displayed. If the required course change is more than 10° you will need to verify that the upcoming course change is acceptable. Verification is performed by pressing the NAV button after the alert screen is displayed. If no verification is received, the AP35 will continue on the current set course in AUTO mode.



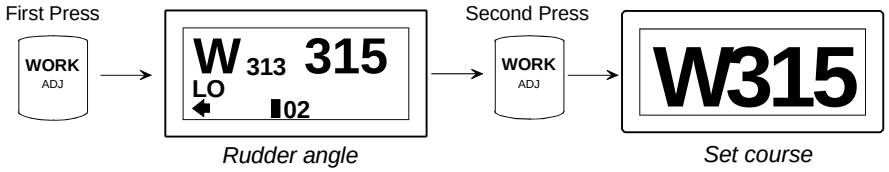
Selecting a different Navigator

If you have more than one Navigation source connected to the AP35, you will be able to choose any for Navigation. Refer to the User Set-up menu for details on selecting a different Navigator.

Note ! *If the AP35 is connected to a Nav. receiver that does not transmit a message with bearing to next waypoint, it will pick a XTE message and steer on Cross Track Error only. In that case you have to revert to AUTO mode at each waypoint and manually change set course to equal bearing to next waypoint and then select NAV mode again.*

2.13 WORK-mode

The WORK-mode is an automatic steering mode to be used under operational conditions different from those normally found when a vessel is in transit on a preset course. Examples are trawling, towing, trolling on one engine, slow speed etc.

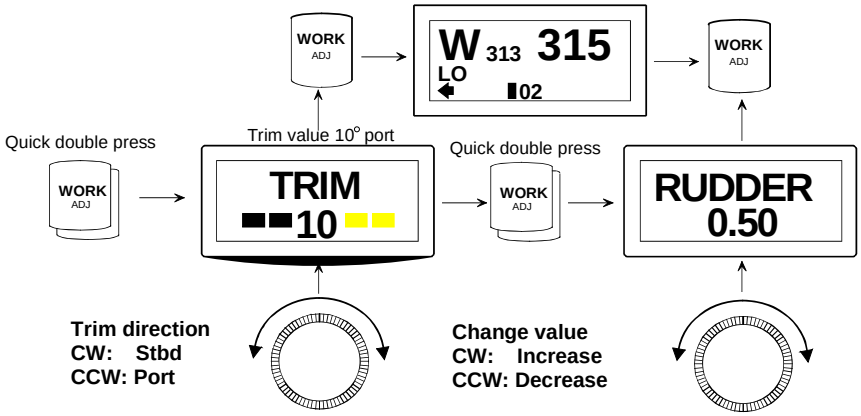


At such incidents some boats may need a rudder off-set when steered by hand. By selecting WORK-mode directly from STBY-mode the rudder off-set is maintained and becomes the TRIM value.

When in WORK mode a quick double press on the WORK button will access the TRIM display and the rotary course dial can then be used to adjust the trim value if needed. The (manual) trim compensates for the autotrim which needs time to build up the appropriate rudder off-set. The TRIM setting is not stored.

A different RUDDER (GAIN) setting may be preferred in WORK mode as compared to that in AUTO (Lo)-mode. A second quick double press on the WORK button following that for the TRIM display will give access to the RUDDER display. The RUDDER value can then be set by the course dial.

The RUDDER value set in WORK mode will be stored in the AP35 memory and is automatically recalled when returning to WORK mode.



The LO (speed) parameters of Counter Rudder (C-RUDD) and Autotrim are automatically selected in WORK mode. The autotrim function and the Off-course alarm are controlled by speed input and are automatically turned off at speeds below 2 kts. If no speed input is provided the autotrim is permanently on and the Off-course alarm operates as in AUTO mode.

If you prefer to have complete manual control of the rudder trim in WORK mode, the autotrim can be permanently disabled at the installation setup.

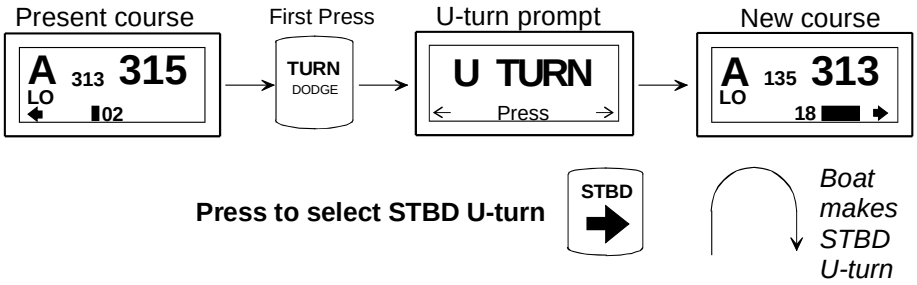
From software version V1R2 onwards the off course alarm is permanently disabled in Work mode. See your s.w. version on initial start-up.

Note ! *Pair-trawling requires manual trim only, and the autotrim should be permanently disabled at the installation setup.*

2.14 TURN-mode

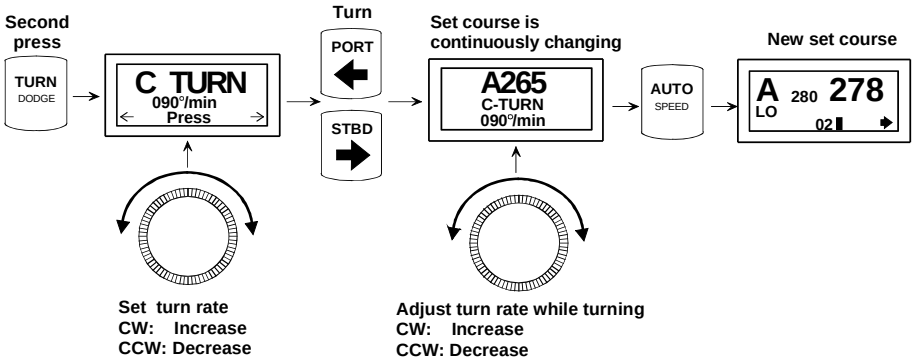
The AP35 provides special turn features when in AUTO or WORK modes.

U-Turn changes the current set course to be 180 degrees in the opposite direction. The user may decide if the U-Turn should be made to Port or Starboard to bring the boat on the new course. U-Turn is activated by a single push on the TURN button. After the single push, the AP35 will continue on the set course until you press either the PORT or STBD button to select the direction to make the U-Turn. If you do not press PORT or STBD within 1 minute, the AP35 will return to the AUTO mode and stay on course.



C-Turn changes the current set course continuously. The user may decide if the C-Turn should be made to Port or Starboard. C-Turn is activated by a second push on the TURN button, and can only be activated when the AP35 is in AUTO or WORK modes. The AP35 will continue on the set course until you press either the PORT or STBD button to select the direction to make the C-Turn. If you do not press PORT or STBD within 1 minute, the AP35 will return to the AUTO mode and stay on course.

The turn rate can be adjusted before the turn is initiated or during the turn.



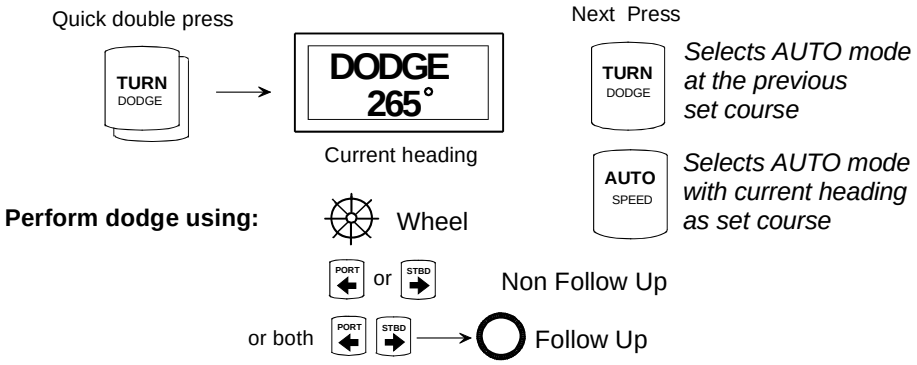
Note ! *Increasing turn rate gives smaller circle or vice versa.*
To leave C-turn press any of the Mode buttons. When pressing the AUTO button the new set course is the one shown on the display at the instant the button is pressed.

2.15 Dodging

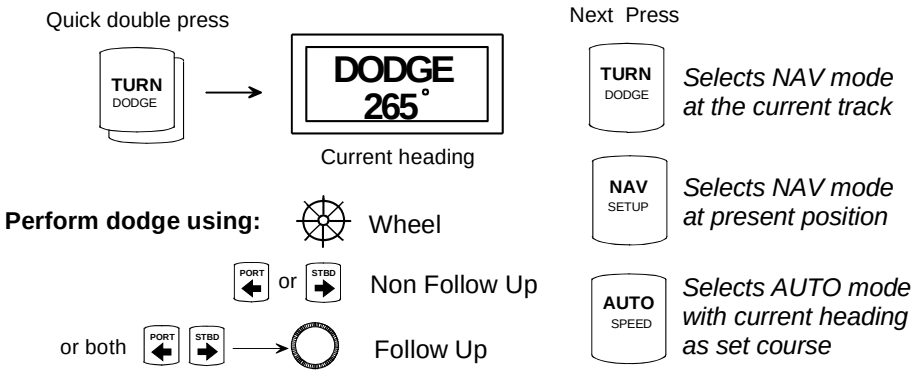
The AP35 also provides the capability for dodging.

Dodging is useful in situations where you need to quickly take control of the helm to steer around an obstruction, and then wish to return on the previous set heading after performing the evasive manoeuvre. A quick double press on the TURN/DODGE button activates dodging.

When in DODGE mode the course displayed is the current boat's heading, however, the previous set course is remembered by the AP35. When DODGE is displayed, the AP35 is no longer in control of the steering, and you must either manually steer the boat or take control using either Non Follow Up steering or Follow Up steering. On manual steering the clutch (or bypass valve) in the drive unit will be disengaged when dodging. The AP35 will remain in the DODGE mode until you exit DODGE by a second press on the TURN/DODGE button or select another mode.



Dodge in NAV



2.16 Multiple station system

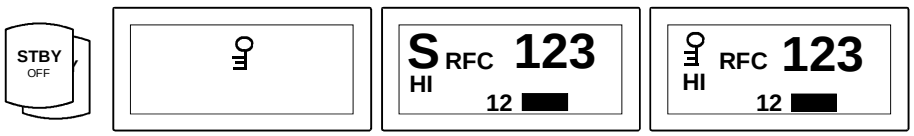
In normal operation of multiple control units, control is accessible from every control unit connected to the AP35 system. One control unit is "active" and provides the user with access to all functions and enables the user to change modes and set the course for automatic course keeping. All remaining control units are "inactive" and have no effect on mode changes or course selection. A single push of either the STBY (or AUTO or NAV) buttons on an "inactive" control unit will allow transfer of command and make it "active".

2.17 Lock function

The "LOCK" function is a safety feature included in the AP35 system to disable all control units except for a single, user selected control unit location.

When the "lock" function is in use, no transfer of command may take place; only the "active" control unit stays in command.

To enable the "lock" function, make a quick double press on the STBY button.

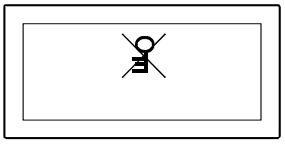


The display on the "active" control unit will first show a single key icon followed by the primary display on which the key icon will alternate with the mode index.

The "locked" control units in the system will show:

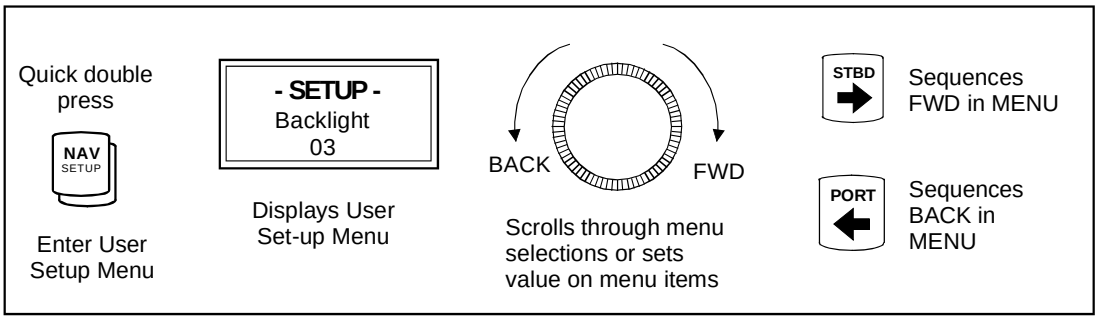
The “Lock function is disengaged by the following actions:

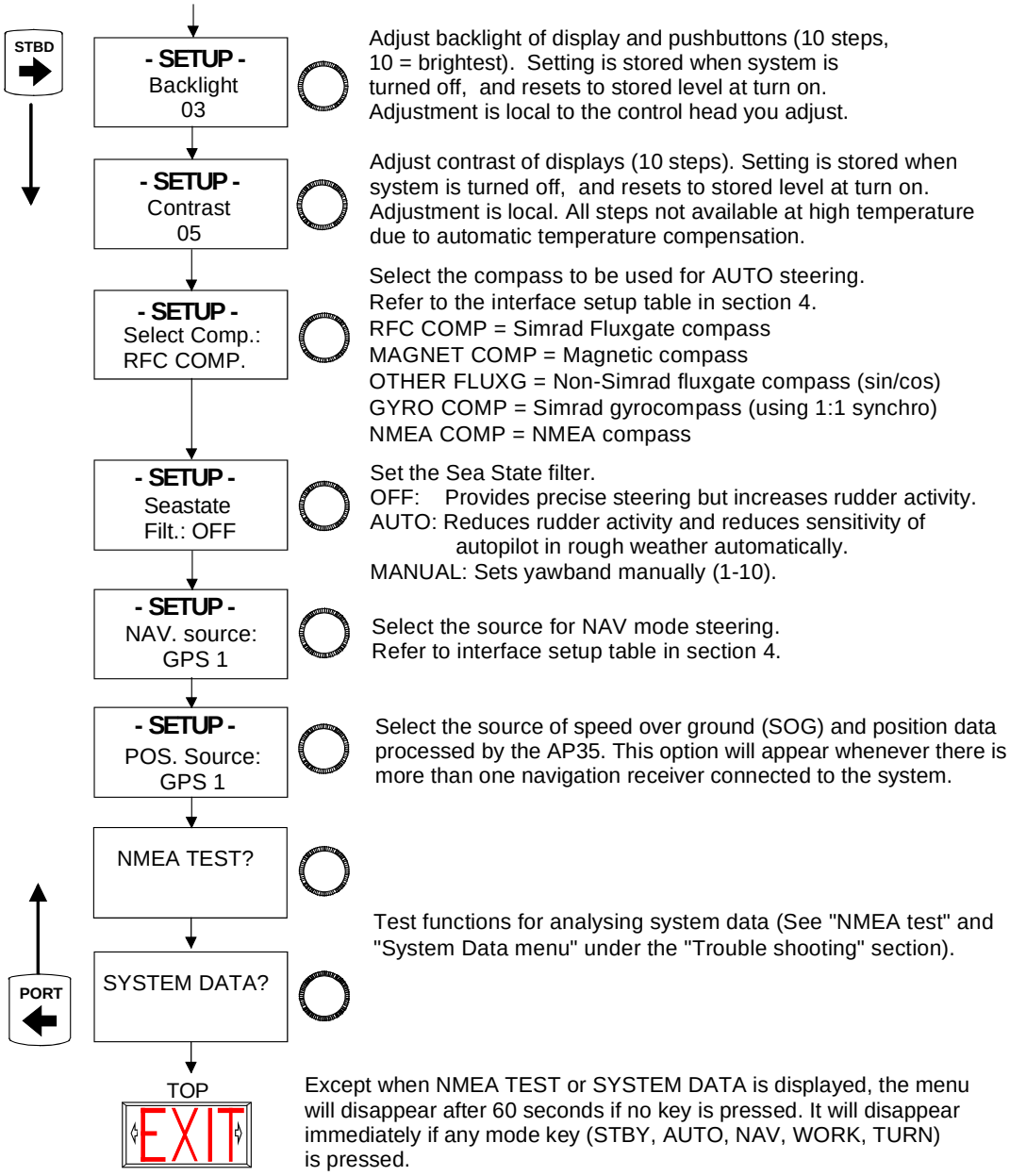
- The “active” control unit unlocks by a double press on the STBY button.
- The system is switched OFF by any control unit (press STBY for 2-3 seconds).



After having "unlocked" the other control stations, the "active" control unit will show the above symbol before the display returns to normal. All other control units will return to the "inactive" state.

2.18 User Set-up Menu




STBD
- SETUP -
Backlight
03
Adjust backlight of display and pushbuttons (10 steps, 10 = brightest). Setting is stored when system is turned off, and resets to stored level at turn on. Adjustment is local to the control head you adjust.
- SETUP -
Contrast
05
Adjust contrast of displays (10 steps). Setting is stored when system is turned off, and resets to stored level at turn on. Adjustment is local. All steps not available at high temperature due to automatic temperature compensation.
- SETUP -
Select Comp.:
RFC COMP.
Select the compass to be used for AUTO steering.
Refer to the interface setup table in section 4.
RFC COMP = Simrad Fluxgate compass
MAGNET COMP = Magnetic compass
OTHER FLUXG = Non-Simrad fluxgate compass (sin/cos)
GYRO COMP = Simrad gyrocompass (using 1:1 synchro)
NMEA COMP = NMEA compass
- SETUP -
Seastate
Filt.: OFF
Set the Sea State filter.
OFF: Provides precise steering but increases rudder activity.
AUTO: Reduces rudder activity and reduces sensitivity of autopilot in rough weather automatically.
MANUAL: Sets yawband manually (1-10).
- SETUP -
NAV. source:
GPS 1
Select the source for NAV mode steering.
Refer to interface setup table in section 4.
- SETUP -
POS. Source:
GPS 1
Select the source of speed over ground (SOG) and position data processed by the AP35. This option will appear whenever there is more than one navigation receiver connected to the system.
NMEA TEST?
SYSTEM DATA?
Test functions for analysing system data (See "NMEA test" and "System Data menu" under the "Trouble shooting" section).
PORT
TOP
EXIT
Except when NMEA TEST or SYSTEM DATA is displayed, the menu will disappear after 60 seconds if no key is pressed. It will disappear immediately if any mode key (STBY, AUTO, NAV, WORK, TURN) is pressed.

Note ! *It is necessary to select the correct compass and Nav. source to make the autopilot operate.*

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3 TECHNICAL SPECIFICATIONS

3.1 AP35 Autopilot System

Boat size and type: .....Up to 45 feet, Power

Steering system types: .....Hydraulic, Mechanical, Solenoids

Inter-unit connection: .....ROBNET network or two-wire supply/data

System ON/OFF: .....From control units

Supply voltage: .....See junction units

Power consumption: .....Dependent on system configuration

Environmental Protection:

- Control Unit: IP56
- RFC35, RC25, CDI35, ...IP56
- RF300 .....IP56
- J300X IP44
- NI300X, GI51 .....IP44

EMC protection: .....EN60945 : 1993, A1 : 1993

Automatic Steering control:

- Rudder Drive: .....Proportional rate or solenoid on/off
- Parameter selection: .....Automatic with manual override
- Sea state control: .....Adaptive sea state filter

Language selection: .....English, Norwegian, French, Spanish, Italian, Dutch, Swedish, German.

Electronic Interface:

- Navigation interface: .....NMEA 0183
- NMEA input/output ports: Max. 6 (see junction units and NI300X specifications)
- Optional output: Simrad/Anritsu and Furuno radar display (clock/data)

Heading sensors:

- Standard: .....RFC35 Electronic Fluxgate compass
- Options: .....Magnetic compasses
  - RC25 Rate Compass
  - Simrad RGC gyrocompasses
  - HS50 GPS compass
  - Other NMEA compasses

Course Selection: .....Rotary course dial and push button

Alarms: .....Audible and visual, optional external

Alarm modes: .....Off course, system failures, overload

Steering modes: .....Standby, Non-follow up, Follow-up, Auto, Nav, Work

Special Turn mode: .....Dodging, U-Turn, C-Turn (30-360°/min.)

3.2 AP35 Control Unit

Dimensions:.....See Figure 3-1
Weight:.....0,9 kg (2.0 lbs)
Display:
Type:.....Backlit LCD matrix display
Resolution:.....80 x 32 pixels
Color:.....Black
Illumination:.....Adjustable in 10 steps
Environmental Protection:.....IP56
Safe distance to compass:.....0.5 m (1,6 ft)
Temperature:
Operating:.....0 to +55 °C (+32 to +130 °F)
Storage:.....–30 to +80 °C (–22 to +176 °F)

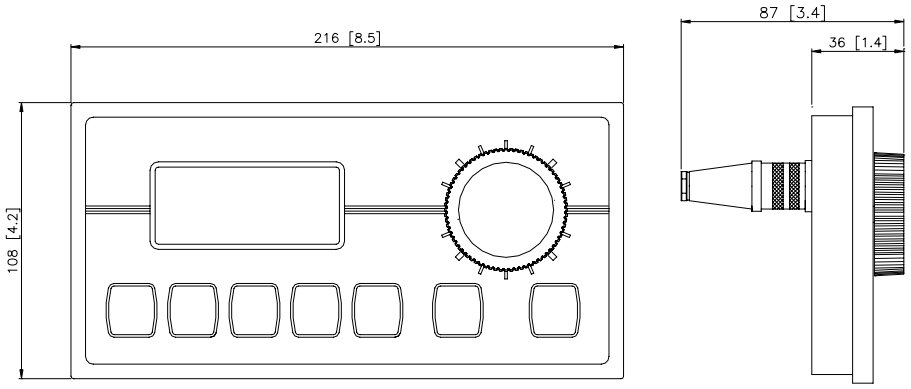


Figure 3-1 AP35 Control Unit - dimensions
Drw. no. N3-208305

3.3 Junction units

Dimensions:.....See Figure 3-2 and Figure 3-3
Weight:
J300X/J3000X .....1,3 kg (2,9 lbs.)
J300X-40 .....2,8 kg (6,2 lbs)
Supply voltage:
J3000X.....10-28V DC
J300X/J300X-40.....10-40V DC
Reverse voltage protection .....Yes (not J300X-40)
Power consumption:.....5 Watt (electronics)
Clutch/bypass load: .....Max 1,5 Amps
Motor / solenoid drive:
J3000X.....6 A continuous, 12 A for 5 seconds
J300X.....10 A continuous, 20 A for 5 seconds
J300X-40 .....20 A continuous, 40 A for 5 seconds
Heading Sensor input: .....Composite pulse width modulated

Rudder feedback input: .....Frequency signal, 3400 Hz., 20 Hz/deg.
Rudder feedback units:.....RF300 or RF45X
NMEA input/output ports:.....J3000X: 1 (one)
J300X, J300X-40: 2 (two)
External Alarm: .....Open collector
Temperature range:
Operation: ..... 0 to +55 °C (+32 to +130 °F)
Storage:.....–30 to +80 °C (–22 to +176 °F)
Mounting: .....Bulkhead mount
Material: .....Anodized aluminium and black ABS cover

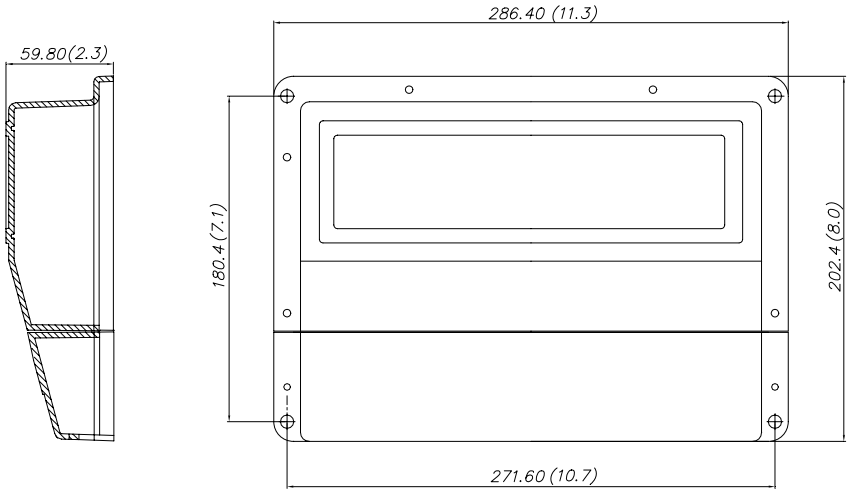


Figure 3-2 J300X/J3000X Junction Unit - Dimensions

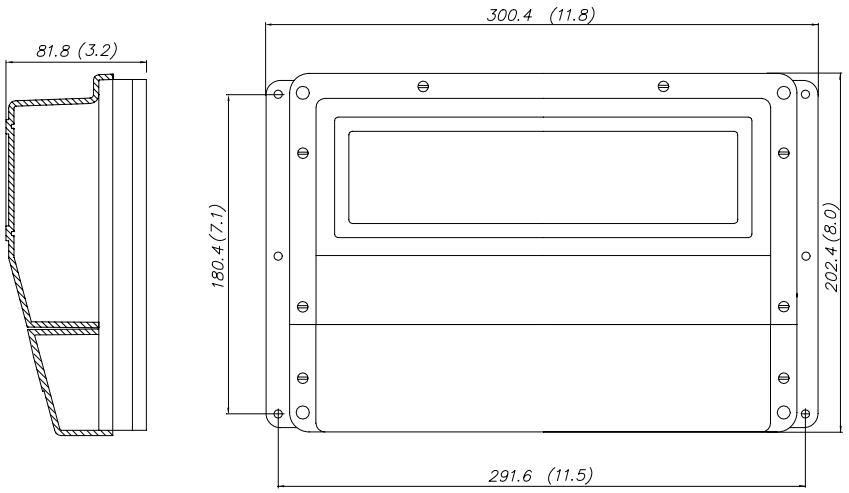


Figure 3-3 J300X-40 Junction Unit - Dimensions

3.4 RFC35 Fluxgate compass

Dimensions:.....See Figure 3-4

Weight: .....0,9 kg (2,0 lbs)

Supply and output:.....Polarity independent 2-wire supply with superimposed pulse width modulation

Automatic Performance:

Calibration: .....Automatically activated by control head

Gain compensation: .....Automatically adjusted continuously

Repeatability:.....± 0.5 degrees

Roll/Pitch:.....± 35 degrees

Accuracy:.....<1° (rms)

Cable supplied: .....15 m shielded cable

Temperature range:

Operation: .....0 to +55 °C (+32 to + 130 °F)

Storage: .....–30 to +80 °C (–22 to +176 °F)

Environmental Protection:.....IP56

Mounting: .....Deck or bulkhead

Material: .....Black ABS

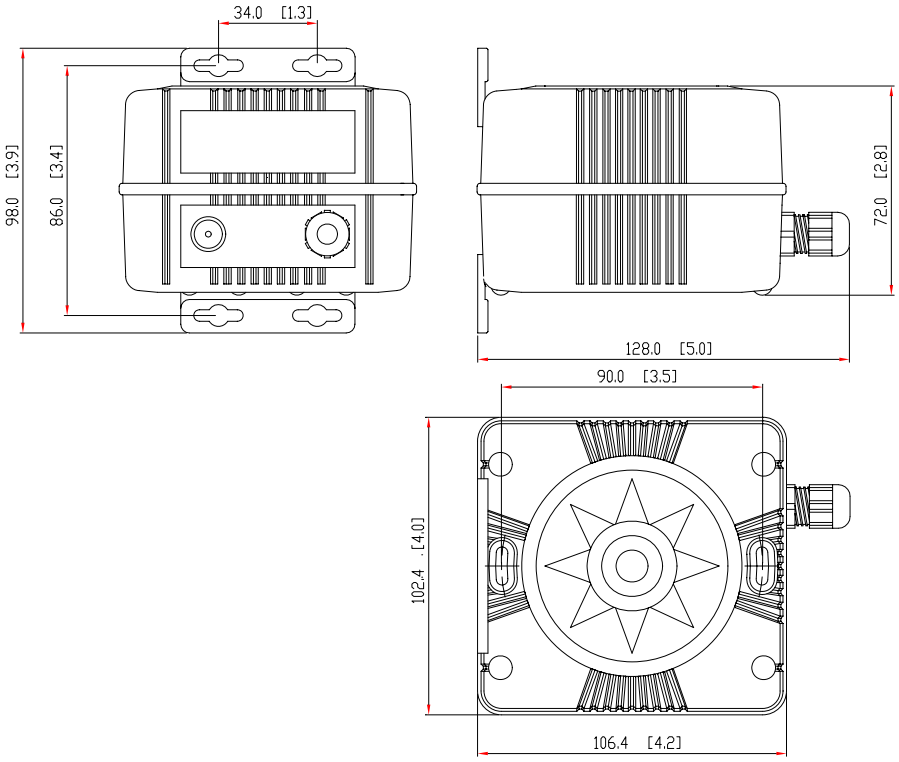


Figure 3-4 RFC35 Fluxgate Compass – Dimensions

3.5 RC25 Rate Compass

Dimensions:.....See Figure 3-4
Weight:.....0,9 kg (2,0 lbs)
Power consumption:.....0,9 watts
Supply and interface:.....Robnet
Environmental Protection:.....IP56
Material:.....White ABS
Temperature range:
- Operation:.....0 to +55 °C (+32 to + 130 °F)
- Storage:.....–30 to +80 °C (–22 to +176 °F)

Mounting:.....Deck or bulkhead
Cable supplied:.....15 m (49') Robnet cable with connector
Automatic Performance:
- Calibration:.....Automatically activated by control head

Rate sensor stabilized heading output:
- Accuracy:.....<1.25° rms (after calibration)
- Repeatability:.....<0.2° rms
- Roll/Pitch:.....± 35 degrees

3.6 CDI35 Course Detector Interface

Dimensions:.....See Figure 3-4
Weight:.....0,9 kg (2,0 lbs) including cable
Power consumption:.....0,9 watts
Supply and output:.....Polarity independent 2-wire supply with superimposed pulse width modulation
Environmental Protection:.....IP56
Safe distance to compass:.....0.1 m (0.3 ft.)
Material:.....Black ABS
Temperature range:
- Operation:.....0 to +55 °C (+32 to + 130 °F)
- Storage:.....–30 to +80 °C (–22 to +176 °F)

Mounting:.....Deck or bulkhead
Cable supplied:.....15 m (49') single twisted pair, shielded
Automatic Performance:
- Calibration:.....Automatically activated by control head
- Repeatability:.....± 0.5 degrees
- Accuracy: errors from course: ± 1,0° after calibration (not including detector)

3.7 RI35 Mk2 Rudder Angle Indicator

Dimensions:.....See Figure 3-5

Weight:.....1.0 kg

Supply voltage:.....12/24V DC –25%/+30%, polarity independent

Power consumption:.....Max 3 W

Input signal:.....Frequency 3400 Hz (midship reference), ±20Hz/degree, polarity independent
Current: 0.1 - 1.1mA (midship 0,6mA), polarity independent
NMEA 0183 RSA (min. 10 Hz)
$--RSA,x.x,A,x.x,A*hh<cr><lf>

Output signal: .....NMEA 0183 RSA 20Hz:
$--RSA,xx.x,A,,*hh<cr><lf>

Accuracy:.....±1° (Indicator alone)

Temperature range:.....Storage: –30°C to +80°C

Operating: –10°C to +55°C

Environmental protection:.....IP56

Safe distance to
magnetic compass: .....0.3 m (1 ft)

Cable: .....20 m, single twisted pair (not connected).

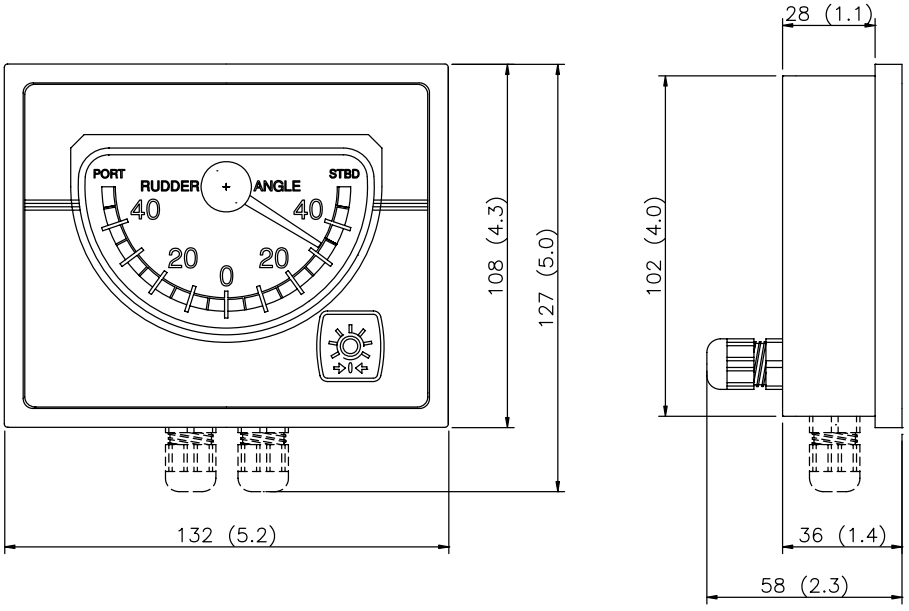


Figure 3-5 RI35 Mk2 Dimensions

3.8 RF300 Rudder Feedback Unit

Dimensions:.....See Figure 3-6 and Figure 3-7.

Weight:.....0,5 kg (1,1 lbs)

Rudder angle: .....± 90 degrees

Output signal: .....Polarity independent frequency signal

Frequency resolution: .....Centre: 3400 Hz, 20 Hz/degree of change

Linearity: ± 3 degrees up to 45 degrees of rudder

Cable supplied:.....10 m twisted pair shielded cable

Mounting: .....Horizontal, vertical, upside down

Material: .....Polyacetal (POM)

Environmental Protection:.....IP56

Temperature range:

Operation: .....–10 to +55 °C (+14 to +130 °F)

Storage:.....–30 to +80 °C (–22 to + 176 °F)

Transmission link:.....Stainless 350mm (13.8") with 2 ball joints. Ball joint stud for rudder arm requires 4.2mm dia hole and 5mm tap.

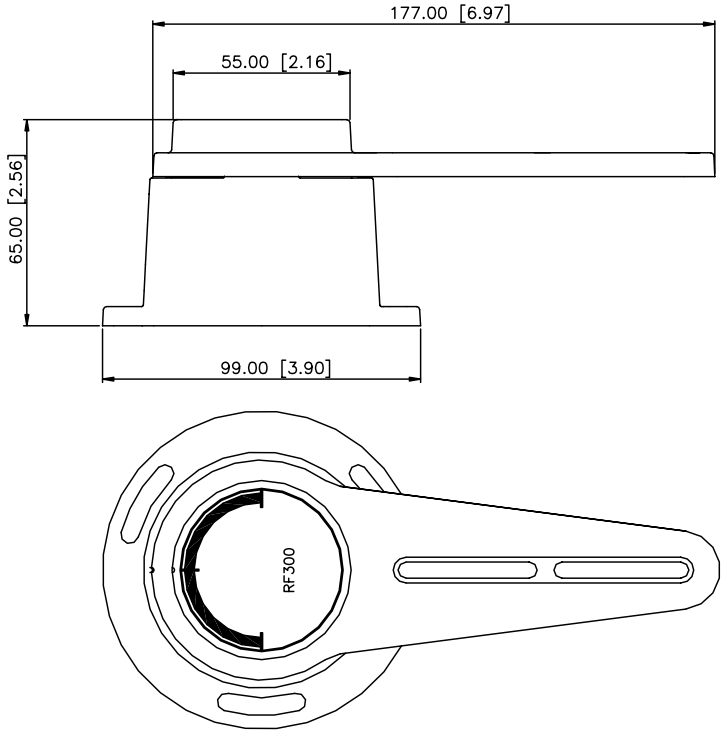


Figure 3-6 RF300 Rudder Feedback - Dimensions

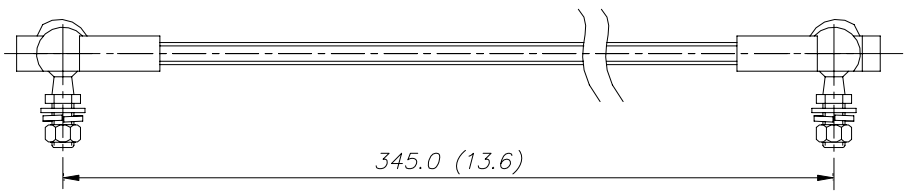


Figure 3-7 Transmission link - Dimensions

3.9 RF45X Rudder Feedback Unit

Dimensions:.....See Figure 3-8
Protection: IP56
Ambient temperature:.....–10 - +55°C
Operating voltage: .....12V DC (autopilot supplied)
Frequency output, Feedback: .....3400Hz (midship reference)
Port: +20Hz/degree, stbd: -20Hz/degree
Current output, Indicator .....0.1mA - 1.1mA
Capacity:.....5 indicators in series
Rudder angle: .....±45°
Cable length:.....2 m (6 ft)

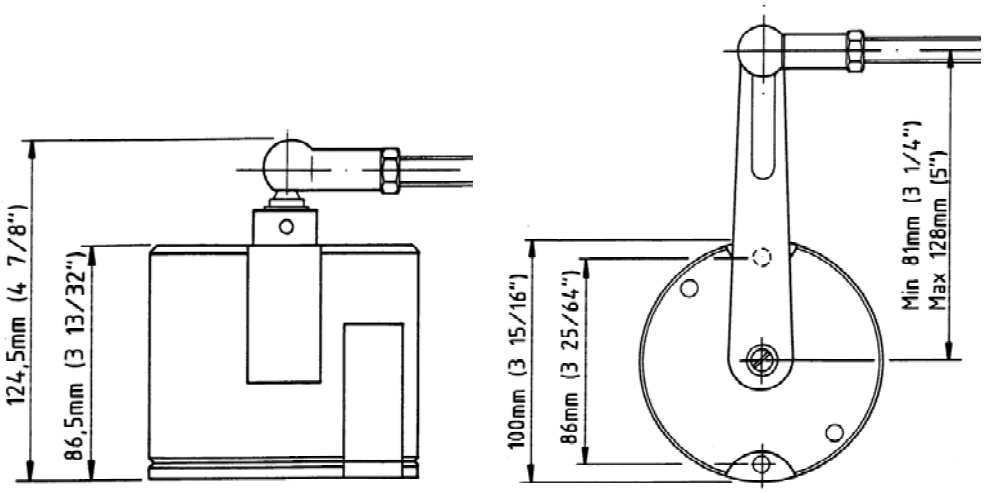


Figure 3-8 RF45X Rudder Feedback Unit

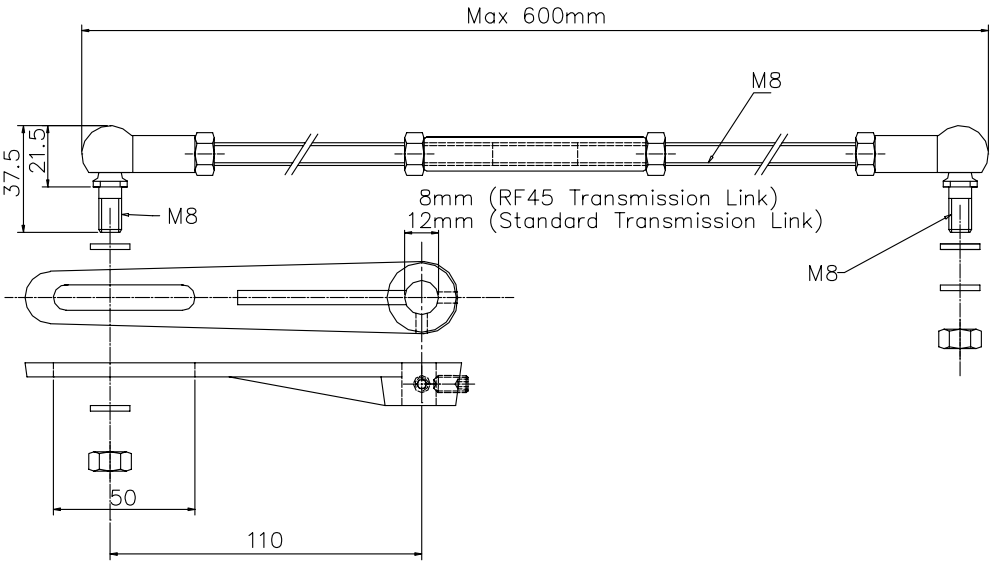
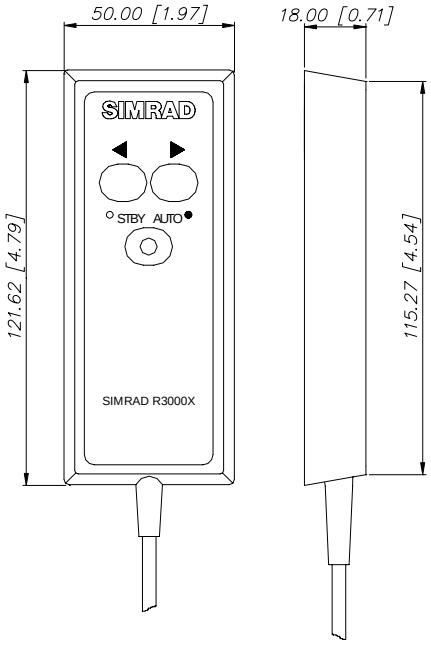


Figure 3-9 RF45 Transmission Link

3.10 R3000X Remote



Dimensions: ..... See Figure 3-10
Weight: ..... 0,4 kg (0,9 lbs)
Material: ..... Epoxy-coated aluminum
Protection IP56
Safe distance to compass: ..... 0.15 m (0.5 ft.)
Temperature range:
Operating: ..... –25 to +55°C (–13 to +130°F)
Storage: ..... –30 to +80°C (–22 to +176°F)
Cable: ..... 7 m (23 ft.), shielded
Mounting bracket: ..... Supplied

Figure 3-10 R3000X - Dimensions

3.11 GI51 Gyro Interface

Dimensions: ..... See Figure 3-11
Weight: ..... 0.8 kg (1.8 lbs.)
Material: ..... Epoxy coated aluminum
Environmental Protection: IP44
Safe distance to magnetic compass: ..... 0.2 m (0.7 ft.)
Temperature range:
Operation: ..... –25 to +55 °C (–13 to +130 °F)
Storage: ..... –30 to +80 °C (–22 to +176 °F)
Cable inlets ..... Rubber glands for cable diameter 10-14mm
Mounting: ..... Bulkhead mount
Supply voltage: ..... 12, 24 or 32V DC +30%/-10% or Robnet (26-42V DC)
Power consumption: ..... 2.4 W
Load: ..... Maximum 20 mA

Input (valid when used with AP35)

Synchro 1:1, ROT max 20°/sec.: 26 - 115V, 400Hz ext ref.,11.8-90V L/L ±0.5° accuracy
NMEA0183 heading ..... HDT, HDG, HDM
RGC11 serial heading ..... 9600 baud
RGC12 serial heading ..... 9600 baud
NFU with mode sel. (S9) ..... Potential free contacts
Selector ..... Pendulum function, Offset adjustment

Output (valid when used with AP35)

Robnet.....Heading T & M, speed, NFU
Analog sin/cos .....0-5V DC
Step 6 step/°, max rate 20°/sec: ..... 24V DC, 20mA
Simrad (Anritsu)/Furuno clk/data for 2 radars 0-5V, 40Hz, 20mA
NMEA183
Heading..... HEHDT/HEHDG, 10Hz
Rate of turn: .....TIROT if rate input according to IMO A.526 (13)
AGROT (autopilot system) or
IIROT (stand alone) if calculated from heading

See GI51 Manual for complete specifications of input/output

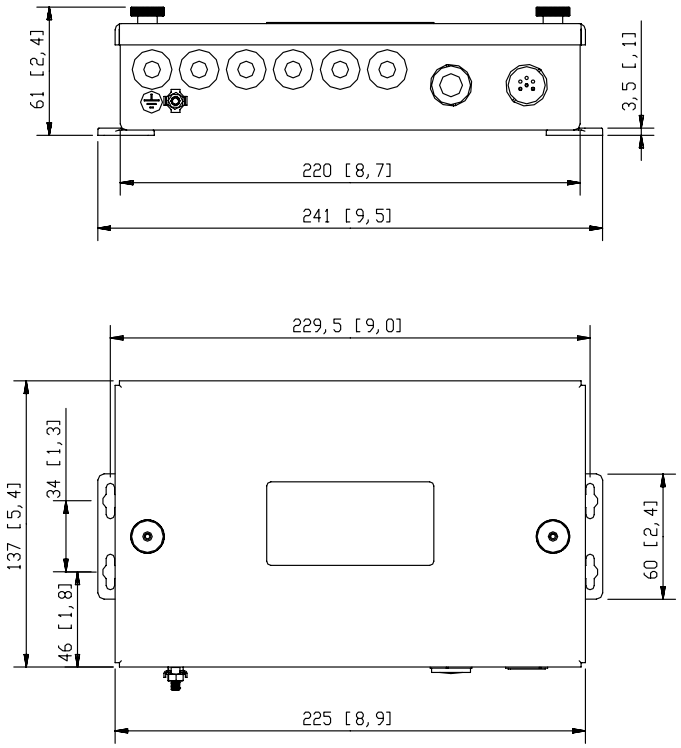


Figure 3-11 GI51 and NI300X - Dimensions

3.12 NI300X NMEA Interface

Dimensions:.....See Figure 3-11
Weight: ..... 0,9 kg (2,0 lbs)
Power consumption: .....3 W
NMEA183 input/output:.....4 ports, max output load 20 mA
Heading output: .....Simrad/Anritsu and Furuno radar display
(clock/data, 0-5V, 50 msec.)
NMEA instrument supply:..... 12V DC, max 0.25A

Robnet network interface: ..... 2 network connectors
Cable inlets: .....Rubber glands for cable diam 10-14 mm
Mounting: ..... Bulkhead mount
Material:..... Epoxy coated aluminium
Environmental Protection:..... IP44
Temperature range:
Operation:..... 0 to +55 °C (+32 to +130 °F)
Storage: .....–30 to +80 °C (–22 to +176 °F)

3.13 S35 NFU Steering Lever

Dimensions: ..... See Figure 3-12
Weight: ..... 1.4 kg (inclusive cable)
Max. inductive load:..... 4A/24V DC, 60mA/110V AC, 25mA/220V AC
Temperature range:..... Storage: –30 to 80° C
Operation: –10 to 55° C.
Environmental protection:... IP56
Safe distance to compass:.... 0.5 m (1,6 ft.)
Power consumption (light):. 6 mA
Cable: ..... 10 m cable with six wires connected through bottom gland

Note ! *Cable gland may be moved to the back side.*

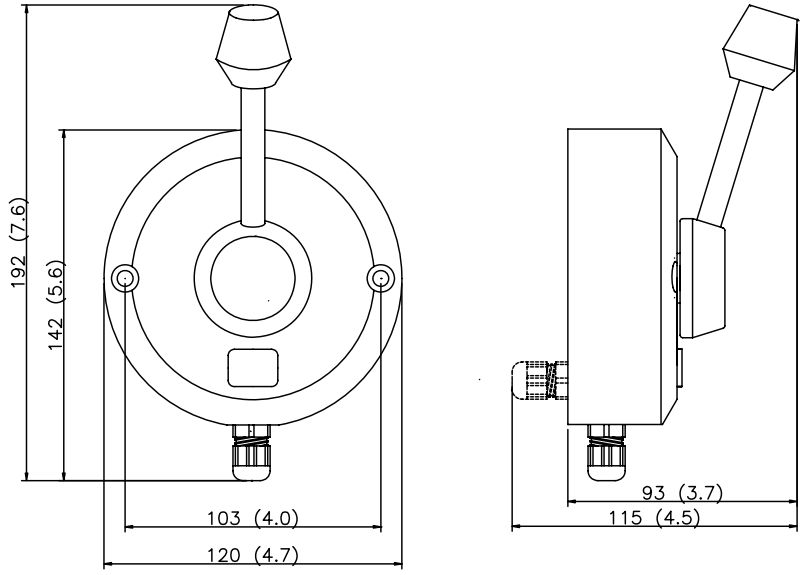


Figure 3-12 S35 - Dimensions

3.14 FU50 Steering Lever

Dimensions:.....See Figure 3-13.
Handle can be mounted pointing upwards or downwards.

Weight: .....1.2 kg (2.6 lbs.) including cable

Material: .....Polyacetal (POM)

Environmental protection: .IP56

Power consumption: 3W

Safe distance to compass:..0.15 m (0.5ft.)

Temperature:
Operating:.....–10 to +55°C (+14 to +130°F)
Storage: .....–30 to +80°C (–22 to +176°F)

Cable: .....10 m (33 ft.) cable with three twisted pairs of wire run through a cable gland (see Figure 3-13).
Alternatively the cable gland can be mounted on the back cover.

Max. rudder command angle: Equal to physical stop minus 2°

Autopilot interface:.....Via proprietary Robnet™ bus.

Accuracy:.....±1° within ±40° of mid-position at 25°C.

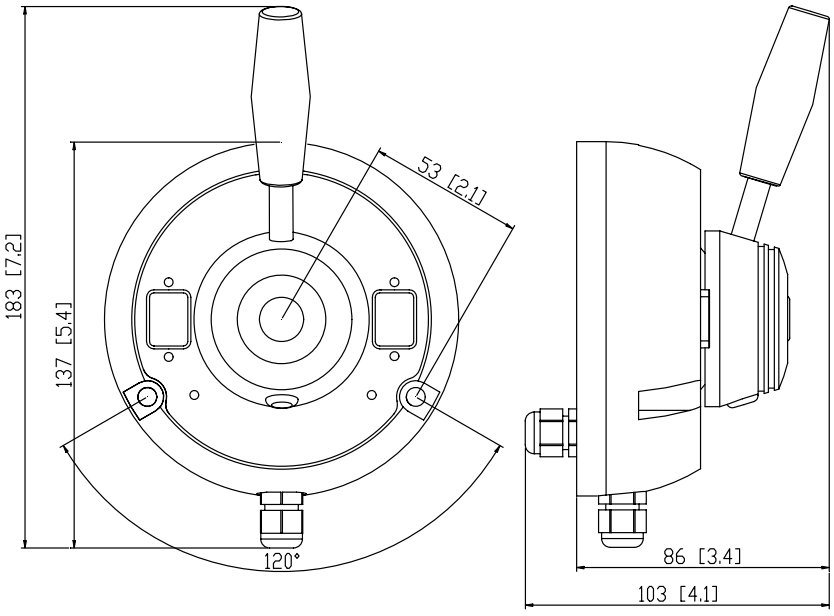


Figure 3-13 FU50 Dimensions

3.15 IP protection

Each part of a Simrad autopilot system has got a two digits IP protection code.

The IP rating is a method to classify the degree of protection against solid objects, water ingress and impact afforded by electrical equipment and enclosures. The system is recognised in most European countries and is set out in a number of British and European standards.

The first code number describes the protection against solid objects, and the second number describes the protection against liquids.

FIRST NUMBER Protection against solid objects		**SECOND NUMBER** Protection against liquids	
IP	**TESTS**	**IP**	**TESTS**
0	No protection	0	No protection
1	Protection against solid objects up to 50 mm, eg. accidental touch by hands.	1	Protected against vertically falling drops of water (eg. condensation).
2	Protection against solid objects up to 12 mm, eg. fingers.	2	Protected against direct sprays of water up to 15° from the vertical.
3	Protection against solid objects over 2.5 mm (tools + wires)	3	Protected against sprays to 60° from the vertical.
4	Protection against solid objects over 1 mm (tools + wires + small wires)	4	Protected against water sprayed from any direction - limited ingress permitted.
5	Protection against dust - limited ingress (no harmful deposit)	5	Protected against low pressure jets of water from all directions - limited ingress permitted.
6	Totally protected against dust	6	Protected against strong jets of water, eg. for use on shipdecks - limited ingress permitted.
		7	Protected against the effects of immersion between 15 cm and 1 m.
		8	Protected against long periods of immersion under pressure.

NMEA messages and data overview for IS15, AP11, AP20, AP35, AP300X, AP3000(X) and J3xx V1R8

Message ident.		HDG	(HDM)	HDT	RSA	MWV	(VWR)	(DBK)	DBT	DPT	MTW	VHW	VLW	GGA	GLL	RMA	RMC	VTG	ZDA	(APA)	APB	BOD	BWW	BWC	BWR	RMB	WCV	XTE	XTR	ZTG	HSC	PSTOI	PSTOC	PSTOE	PSTOK
Data source: (n/p/h=nav/pos/heading source, c=calculated):		h	h	h	c									p	p	p	p	p		n	n	n	n	n	n	n		n		c					
Accept. cond. (N=no nav. flg warning, P= no pos. flg warning):														P	P	P	P	P		N	N	N	N	N	N	P		P							
	Status flag													P*	P	P	P			N	N					P		P							
Compass_Data	Compass heading, M	2	1									X																							
	Compass heading, T	2		3																															
Rudder_Data	Rudder angle				1																														
Wind_Data	Apparent wind angle					2	**1**																												
	Apparent wind speed					2	**1**																												
Depth_Data	Depth ref transducer							**1**	**3**	**2**																									
	Transducer-Keel Offset									X*																									
	Depth range									X																									
Speed_Temp_Data	Speed through water											**1**																							
	Log distance and trip												**1**																						
	Water temperature										**1**																								
Gps_Data	Present position Lat, Long													**4**	**1**	**2**	**3**																		
	COG, T															**1**	**2**	**3**																	
	COG, M																	**1**																	
	Universal Time Coordinated (UTC)													**3**	1		**2**		4					M	M					M					
	Magnetic variation	x														4	**5**																		
	SOG															**1**	**2**	**3**																	
Nav_Data	To-wp position																							**2**	**1**	**3**									
	To-wp ident.																			**6**	**7**	**5**	1	3	2	4									
	From-wp ident.																					3	1			2									
	Bearing wp-wp, T																				6	5	4												
	Bearing wp-wp, M																			5	6	4	3												
	Bearing pos-wp, T																				**4**			**2**	**1**	3									
	Bearing pos-wp, M																				**3**			**2**	**1**										
	Distance pos-wp																							**2**	**1**	**3**									
	Time to go to dest. Wp																													1					
	XTE																			**4**	**5**					**2**		**3**	1						
	Waypoint closure velocity, VMG																									X	1								
Steering_contr1	Heading steering cmd, T / M																														**1**				
Light_Cmd	IS11 illumination																																		
IS15 RX:		x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x				x
IS15 TX:		x			x	x				x	x	x	x			x	x				x					x			x	x	x		x		x
J3xx RX:		x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x		x		x	
J3xx TX:	Transmission interval in sec.->	1	1	1	1										2		2	2					10	10		2		5			10				
J3xx TX:	If Instr. port (ref instr setup)->	.2	1	.2	.2																														
J3xx Channel2 TX:		.1*	1	.1*	1																														

Indata use				Remarks:
AP11, AP35, AP20	AP30UDLX	Out J3XX		Bold red font = {IS15, J3xx and IS11Multi} M=IS11 Multi only, black regular font = {J3xx and IS15}. Blue 'X' IS15 only. Shadowed not to be used any more
			N/P=nav/pos data warning, *DGPS if flag=2	
c		x		
c				
		x		
d,c	d,c		*Not for AP35	
	d			
	d		* Output only	
c	d			
c	d			
	d			
	d	x		
	d	x		
	d	x		
	d,c			
	d,c	x	HDG message in to IS15 see note2	
c	d	x		
	d	x	Not in/out IS15	
d*	d	x	*Not for AP3000	
		x		
	d	x	IS15 sends bearing as magnetic	
d	d	x		
	d	x	IS15 sends bearing as magnetic	
d*	d	x	* Not for AP3000, wp-wp used if no pos-wp data	
d*	d	x	* Not for AP3000	
	d			
d,c	d,c	x		
		x		
^	^	^	^	
d = displayed				
c= used in calc.				
			* HDG out if magn. sensor, HDT out if true sensor	

Note1: APB message may read in true or magnetic bearing wp-wp and bearing pos-wp. These fields are sent as magnetic bearings from IS15
Note2: IS15. *Magnitic variation* from the HDG message is only used to calculate true heading from the data in the same Hdg message, and is not read in to the system.
Magnetic variaton out in the HDG-message is the variation currently in use in the IS15 system, this will be the preset value if none others are available

Proprietary sentences in/out IS15:
In to Is15 $PSTOK,a<CR><LF> Status of compass calibration: a = I:init, R:running, F:failed, C:calibrated
Out from IS15: $PSTOK,,,x.x,*XX<CR><LF> Set compass offset. x.x is offset angle, 0 to 360 degrees
Out from IS15: $PSTOC,*77<CR><LF> Sent start calibration of compass

4 INSTALLATION

4.1 General

This section provides detailed information required to successfully install AP35 Autopilot system

The AP35 system includes several modules that need to be mounted in different locations on the boat, and also need to interface with at least three different systems on the boat:

- The boat's steering system
- The boats electrical system (input power)
- Other equipment on board (NMEA interfacing)

In addition, the advanced capabilities of the AP35 require the installer to perform a series of settings and tests to verify proper operation of the system, refer to the check list below.

4.2 Installation checklist

1. Determine system configuration you are installing (Page 42)
2. Perform the hardware installation (Page 43)
3. Connect external NMEA devices (inputs and outputs, page 60)
4. Set Language (Page 71)
5. Dockside settings (Page 71)
   a) Boat type selection.
   b) Drive unit selection.
   c) Rudder feedback calibration.
   d) Automatic rudder test.
   e) Transition Speed
   f) Autotrim selection in WORK mode
   g) Initial Rudder reference
6. Interface setup for Junction Unit, NI300X and GI51 if installed (Page 76)
7. Perform settings in User Setup Menu page 25, for NAV source, POS source and Compass source
8. Dockside Autopilot tests (refer to Operation Instructions, page 13)
   a) Test all stations (if applicable) - lock/unlock - active/inactive
   b) Test Non-Follow Up mode
   c) Test Follow-Up mode
   d) Test AUTO mode
   e) Test WORK mode
   f) Test NAV mode and input interfaces (if connected) including optional heading sensors
   g) Test interface outputs to external equipment (if connected)
9. Seatrial settings (Page 81)
   a) Set rudder zero
   b) Compass calibration

c) Compass Offset adjustment
d) Automatic tuning (Optional: does not need to be done)
e) Viewing parameters

10. Testing Autopilot Operation at Sea (refer to Sea Trial instructions, page 86)
11. Provide the user with training (Page 87)

4.3 Unpacking and handling

Care should be taken when unpacking and handling the equipment. A visual inspection should be made to see that the equipment has not been damaged during shipment and that all components and parts are present according to the packing list.

A standard scope of supply for an AP35 system will include:

- Control unit with standard installation accessories.
- Junction unit (J300X, J300X-40, J3000X) and one 15 m (49') Robnet cable.
- RFC35 Fluxgate Compass with 15 m (49') cable attached.
- RF300 Feedback unit with 10 m (33') cable attached and transmission rod.
- Appropriate drive unit for the installation (unless the AP35 is going to operate an existing drive unit)
- Optional equipment that may have been ordered for the installation.

4.4 Determine system configuration

It is important to become familiar with the configuration of the system prior to beginning the installation. The AP35 Basic system is shown in Figure 4-1.

Pay particular attention to the junction unit/drive unit combinations on page 49 and the chart on page 9.

As many of the units are communicating on a common network (ROBNET), with identical connectors, the installation is simplified. Try to mount the units within the standard cable length supplied with each unit, if possible. ROBNET Extension Cable (10m) is available from your distributor.

4.5 AP35 System Layout

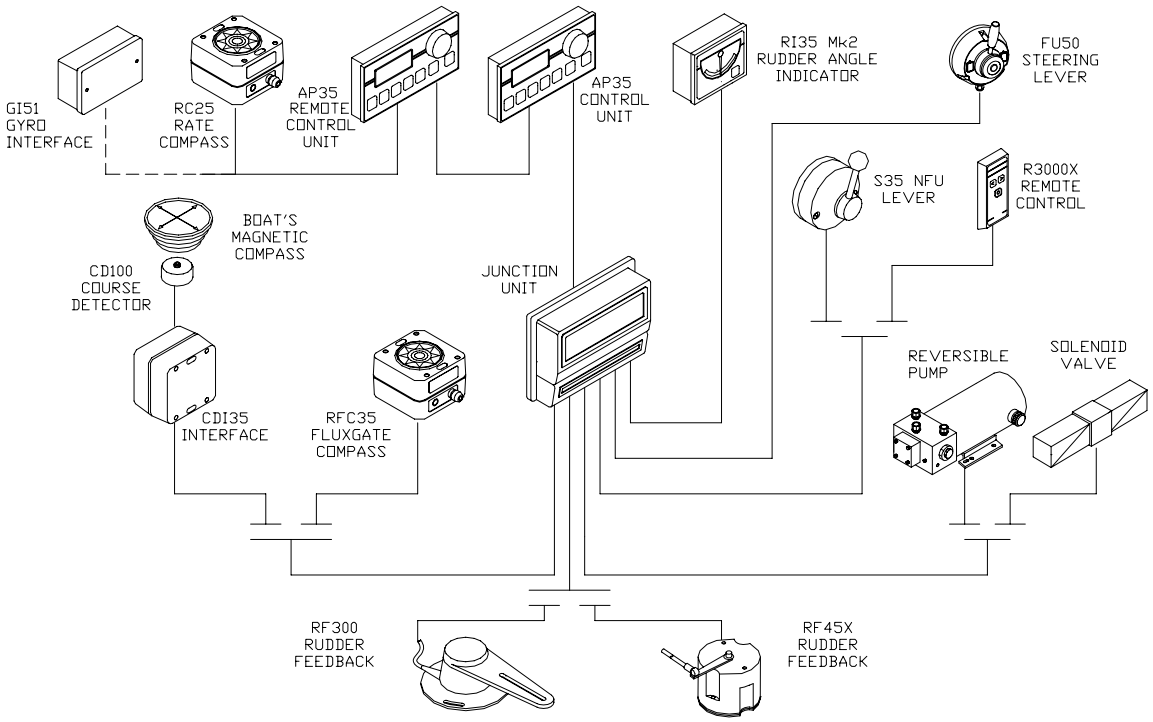


Figure 4-1 AP35 System layout with options

4.6 RF300 Rudder feedback

The RF300 Rudder feedback unit mounts close to the rudders, and is mechanically linked to the rudder tiller arm or rudder quadrant.

Refer to Figure 4-2 for the recommended mounting arrangement. Note that the RF300 transmitter arm has two slots for the transmission link. The slots enable maximum flexibility to provide the 1:1 mechanical linkage relationship.

Note ! *Do not try to remove the transmitter arm from the feedback unit. The unit is factory adjusted and need no further adjustment at installation than described below.*

As a starting point, it is desirable to set the transmitter rod to the inner limit of the outer slot if possible. (Refer to Figure 4-2). Drill and tap the rudder tiller arm so that the Y1 dimension is equal to the Y2 dimension (Use 4.2 mm drill and 5 mm tap). Attach the ball joint to the tiller arm, and connect the transmitter rod to the ball joint at the rudder tiller arm.

Turn the helm wheel to set the rudder tiller arm to approximate centre position.

Rotate the RF300 transmitter lever until it is set to centre position. (Use the alignment mark to line up the transmitter lever to be opposite the cable entry into the feedback.)

Note ! *Carefully observe the alignment marks. A rudder feedback alarm may be the result if the alignment instructions as per Figure 4-2 are neglected.*

Attach the transmitter rod to the RF300. Set the RF300 mounting location to be in accordance with Figure 4-2. The centre of the RF300 should be in line with the centre of the rudder post. Mount the RF300 to a suitable platform using the screws provided. If necessary, add blocking material under the RF300 to adjust the height of the transmission arm to be level with the rudder tiller arm.

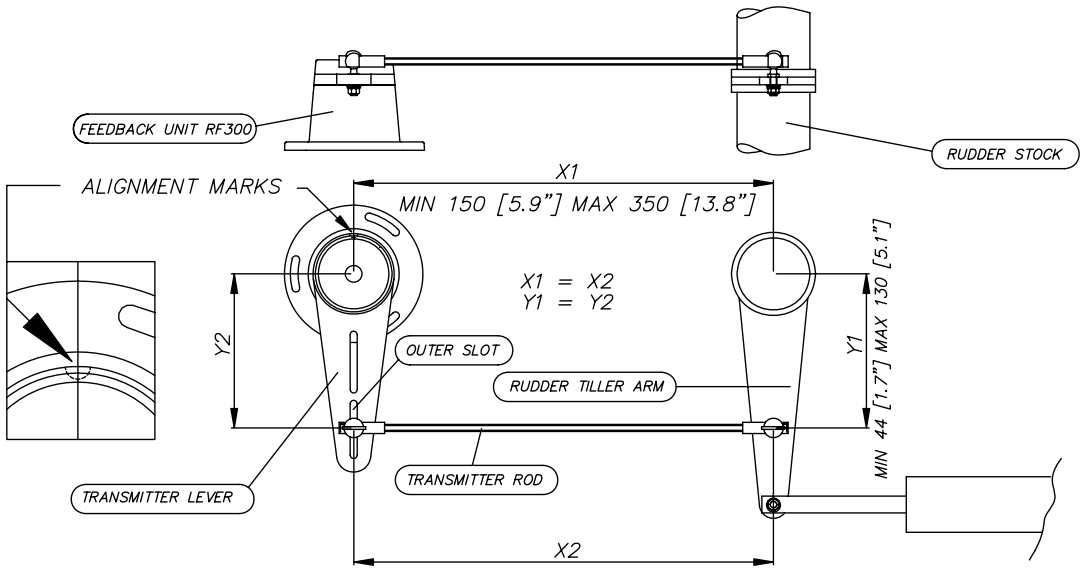


Figure 4-2 RF300 mounting (019356)

Note ! *Due to space limitations, it may be necessary to cut the length of the transmitter rod to move the RF300 closer to the rudder post.*

Tighten the mounting screws for both the RF300 feedback unit and the transmitter rod ball joint.

Observe the RF300 while someone turns the helm wheel through the complete range of travel from full port to full stbd. rudder to verify that the mechanical linkage to the RF300 is not obstructed.

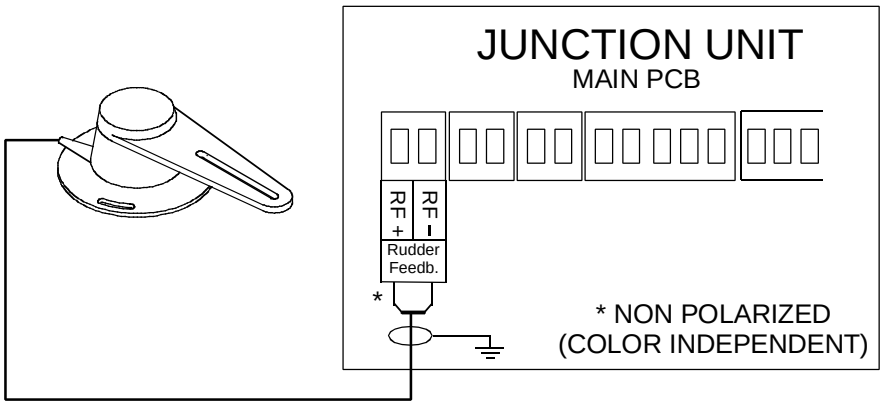


Figure 4-3 RF300 connection

4.7 RF45X Rudder Feedback Unit

The RF45X is normally installed with the shaft pointing upwards. It can, however, be mounted with the shaft pointing downwards if this is more convenient. The deflection can then be inverted as illustrated in Figure 4-5. An “upside-down” installation will make access to within the unit more convenient as the unit can be opened without moving it from the mounting base. To open the unit, unscrew the two screws at the bottom and remove the cover. Be careful with the wires when you put back the cover.

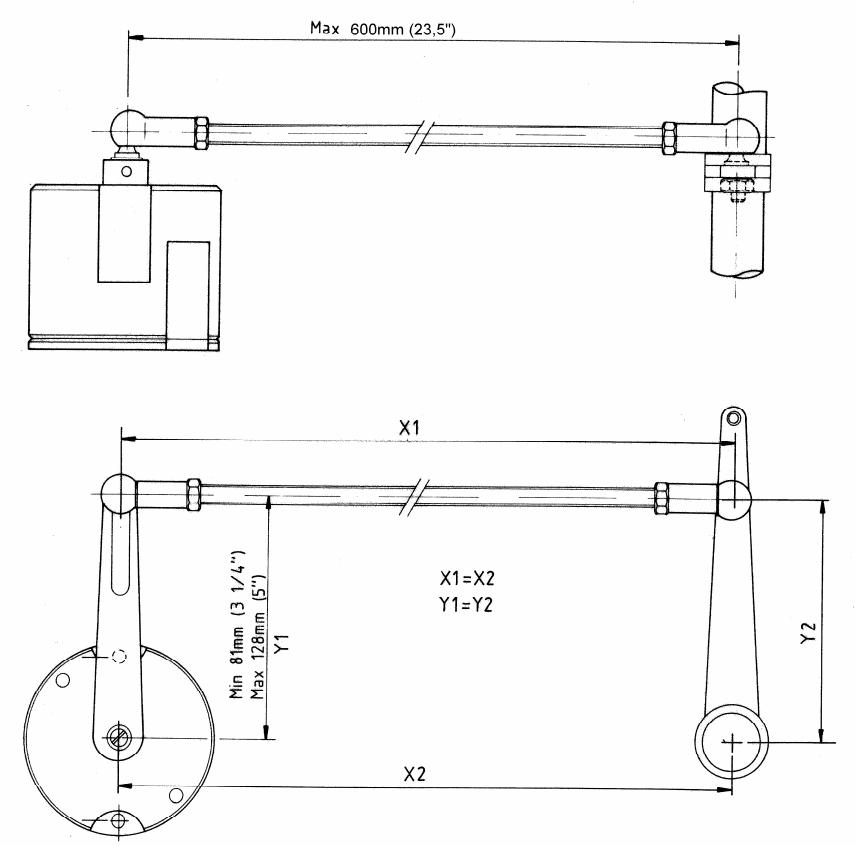


Figure 4-4 RF45X Rudder Feedback Unit - Mounting

Use the attached template (Drw. 22011225) to drill the required mounting holes. The unit is fastened to the mounting base by the two Allen screws enclosed. (Other types of screws may be used if fastened to i.e. a wooden base.)

Make the parallelogram configuration of the transmission link (see Figure 4-4) and temporarily fasten the link to the RF45X shaft. The transmission rod can be shortened by cutting off a piece using a hacksaw. Move the rudder manually h.o. - h.o. and make sure the transmission link is moving freely in both directions.

Electrical connection

Use a twisted pair cable AWG20 (0.5 mm^2) between the breakout box and the J3xx junction unit. The cable length is not critical but should be kept at a minimum.

The cable should be connected to the junction unit according to Figure 4-5. When splicing the cables in the breakout box, crimp the enclosed pins on each wire of the extension cable. Otherwise the wires may be cut off at the terminal point when the screws are tightened.

The screen is not terminated in RF45X and must be connected in the junction unit.

Note ! *The green and yellow wire is not used and must be isolated!*

For final alignment, see page 72.

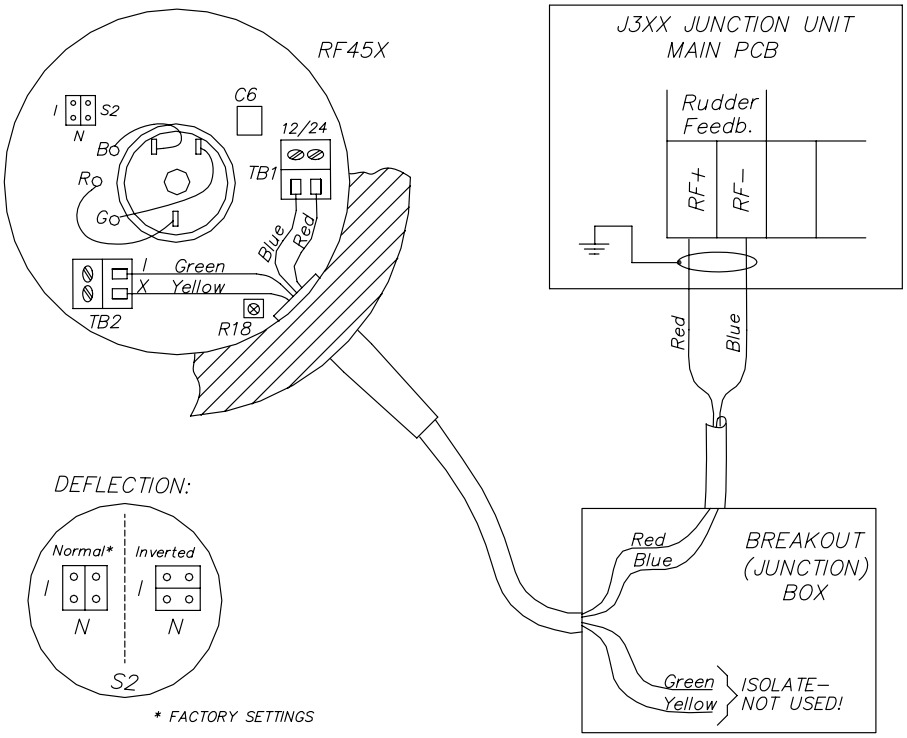


Figure 4-5 RF45X Connection

4.8 Junction unit

The junction unit is designed to operate in a location that provides ambient temperatures below +55°C (+130°F).

Note ! *The junction units (J3000X, J300X and J300X-40) are not water proof and should be mounted vertically as shown in a dry place between the control unit and the drive unit.*

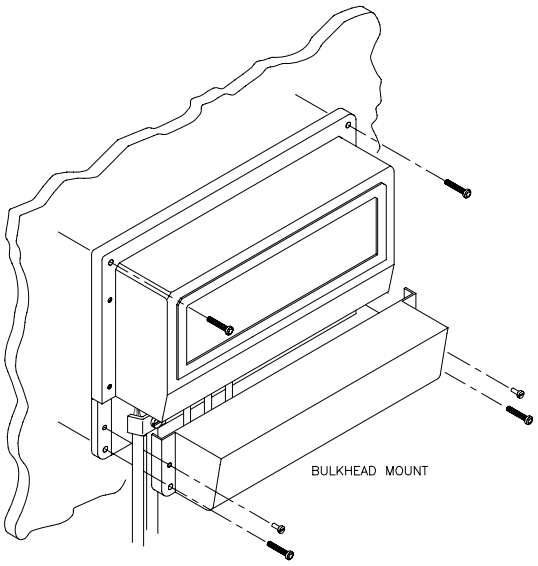


Figure 4-6 J3XX mounting

Cable connections

Use only shielded cables. This includes Mains input, drive units and if necessary for the extension of the RF300 Rudder Feedback cable. The clutch/bypass cable and the solenoid cable should be 1,5 mm^2 (AWG14). Signal cables should be 0.5 mm^2 (AWG20) twisted pairs.

The mains supply cable and the drive unit motor cable should have sufficient wire gauge. This will minimize voltage drop and allow the drive unit to operate at full power.

Refer to the table below for recommended cable sizes.

Cable length	**Drive Unit Voltage**			
1. Distribution Board to Junction Unit.	12 V		24V	
2. Junction Unit to Drive Unit motor (Length refers to each of the two cables)	AWG	mm^2	AWG	mm^2
Up to 3 m (10 ft.)	12	2,5	12	2,5
Up to 6 m (20 ft.)	10	4	10	2,5
Up to 10 m (32 ft.)	8	6	10	4
Up to 16 m (52 ft.)	6	10	8	6

Grounding and RFI

The AP35 system has very good RFI protection and all units are using the Junction Unit as common ground/shield connection. The Junction Unit should therefore have a proper ground connection to the hull.

ROBNET cables and other signal cables (compass, feedback, NMEA) should not be run in parallel with other cables carrying RF or high current, such as VHF and SSB transmitters, battery chargers/generators and winches.

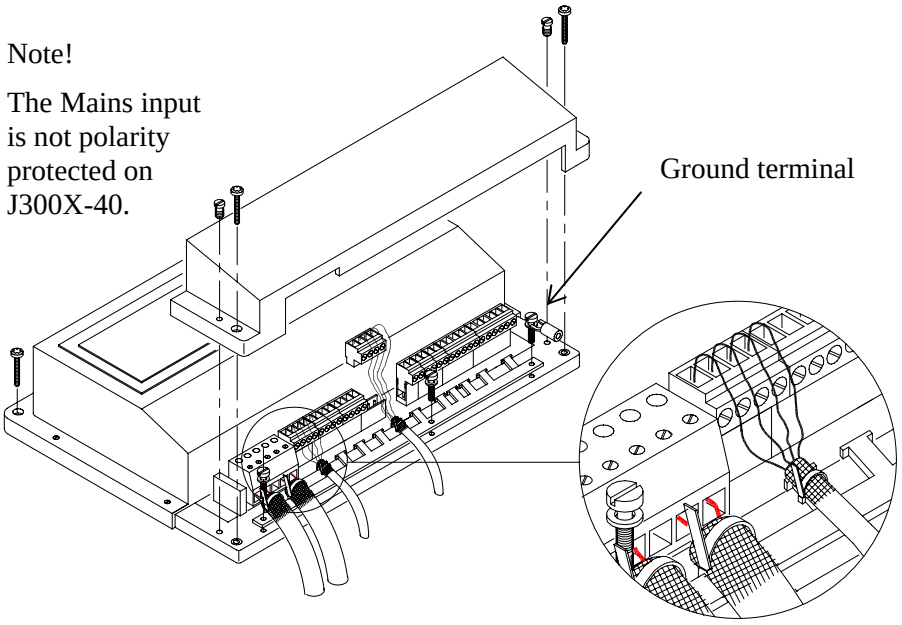


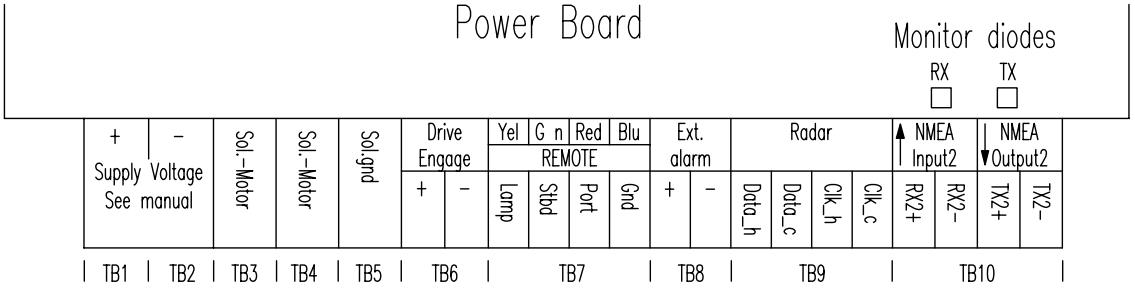
Figure 4-7 J3XX – Screen Termination

Remove the bottom cover to get access to the plug-in terminals. Strip about 1 cm (0.4") of the cable's insulation and pull the screen backwards to cover the insulation. Position the straps as shown and tighten well to make sure the screen has good contact.

Leave sufficient free wires so that the plug-in terminals can be easily connected/disconnected.

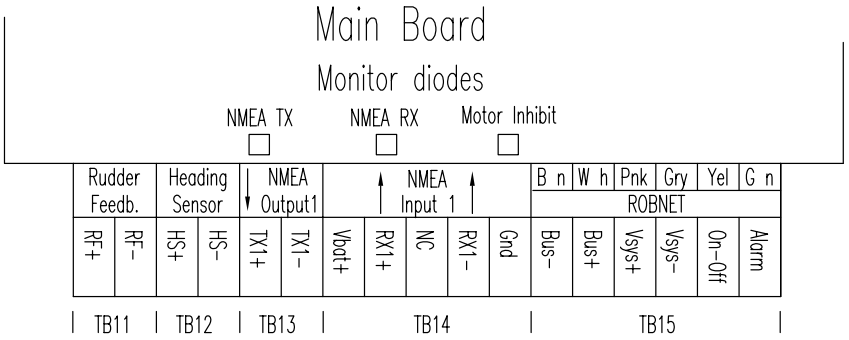
Pull out each terminal before connecting the wires. Remove all strands before putting on the terminal cover.

Junction unit terminals



Power Board terminals

TB9 and TB10 are not on the J3000X Power Board



Main Board terminals

4.9 Drive unit

The relation between drive units, drive unit voltage, input voltage, drive output and interfacing to steering gear are shown in the table below. The AP35 system detects whether a reversible motor or a solenoid is connected and outputs the correct drive signal automatically.

Refer to the connecting diagram for the different drive units on page 51 onwards.

Installation instructions for the drive units are found in the manual for the individual units.

The maximum drive current capabilities of the J3000X and J300X junction units are different. Use the table below as reference.

HYDRAULIC PUMPS

MODEL	MOTOR VOLTS	JUNCTION UNIT	RAM CAPACITY		FLOW RATE AT 10 bar cm^3/min (cu. in/min)	MAX PRES-SURE bar	PWR. CONSUMP-TION
			MIN cm^3 (cu. in.)	MAX cm^3 (cu. in.)			
RPU80	12V	J3000X	80 (4,9)	250 (15,2)	800 (49)	50	2,5-6 A
RPU160	12V	J300X	160 (9,8)	550 (33,5)	1600 (98)	60	3-10 A
RPU300	12V	J300X-40	290 (17,7)	960 (58,5)	3000 (183)	60	5-25 A
RPU300	24V	J300X	290 (17,7)	960 (58,5)	3000 (183)	60	2,5-12 A

Steering gear interface: Hydraulic plumbing

LINEAR DRIVE UNITS

MODEL	MOTOR VOLTS	JUNCTION UNIT	MAX STROKE mm (in.)	PEAK THRUST kg (lb.)	MAX RUDDER TORQUE Nm (lb.in.)	HARD-OVER TIME sec. (30% load)	PWR. CON-SUMP.	TILLER ARM mm (in.)
MLD200	12V	J3000X	300 (11,8)	200 (440)	490 (4350)	15	1,5-6 A	263 (10,4)
HLD350	12V	J3000X	200 (7,9)	350 (770)	610 (5400)	12	2,5-8 A	175 (6,9)
HLD2000L	12V	J300X	340 (13,4)	500 (1100)	1460 (12850)	19	3-10 A	298 (11,7)
HLD2000D	24V	J300X	200 (7,9)	1050 (2310)	1800 (15900)	11	3-10 A	175 (6,9)
HLD2000LD	24V	J300X	340 (13,4)	1050 (2310)	3180 (28000)	19	3-10 A	298 (11,7)
MSD50	12V	J3000X	190 (17,5)	60 (132)	-	15	0,8-2 A	-

Steering gear interface: Connects to quadrant or tiller.

Note !

1. *The motor voltage is stepped down by the junction unit when operating from 24V or 32V mains (except for RPU1 and RPU3).*
2. *The specified junction unit is necessary to achieve max drive unit capacity.*
3. *Recommended operational thrust or torque is 70% of listed value.*
4. *Typical average power consumption is 40% of listed maximum value.*

PREVIOUS MODELS

Drive Unit type	Junction Unit	Drive unit voltage	Input voltage (Mains)	Drive output	Interface to steering gear
RPU100 (1,0l) RPU150 (1,5l) RPU200 (2,0l) (Reversible hydraulic pump)	J300X J300X J300X	12V 12V 24V	12, 24,32V	Proportional rate	Hydraulic plumbing
RPU1 (1,4/2l) RPU3 (3,8/5l)	J3000X J3000X	12V, 24V 24V, 24V		Solenoid valves, on/off	Hydraulic plumbing
MRD100 (Reversible mechanical drive)	J300X-40 J300X	12V 24V	12, 24, 32V 24V, 32V	12V to clutch 24V to clutch Proportional rate to motor	Chain/ sprockets
MRD150	J300X-40 J300X	12V 32V	12, 24V 32V	12V to clutch 32V to clutch Proportional rate to motor	Chain/ sprocket

Note !

*When selecting **DRIVE UNIT** voltage in the Installation setup, the clutch/bypass voltage is always set equal to the motor voltage. If a retrofit installation where e.g. a HLD2000 has a 12V motor and a 24V bypass valve, the bypass valve solenoid has to be changed back to standard 12V version.*

Connecting a reversible pump

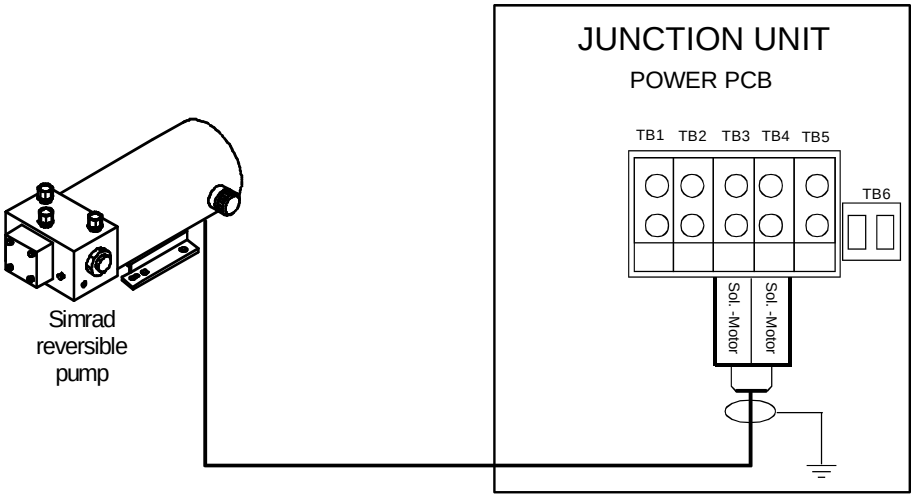


Figure 4-8 Connecting a reversible pump

Connecting a hydraulic linear drive

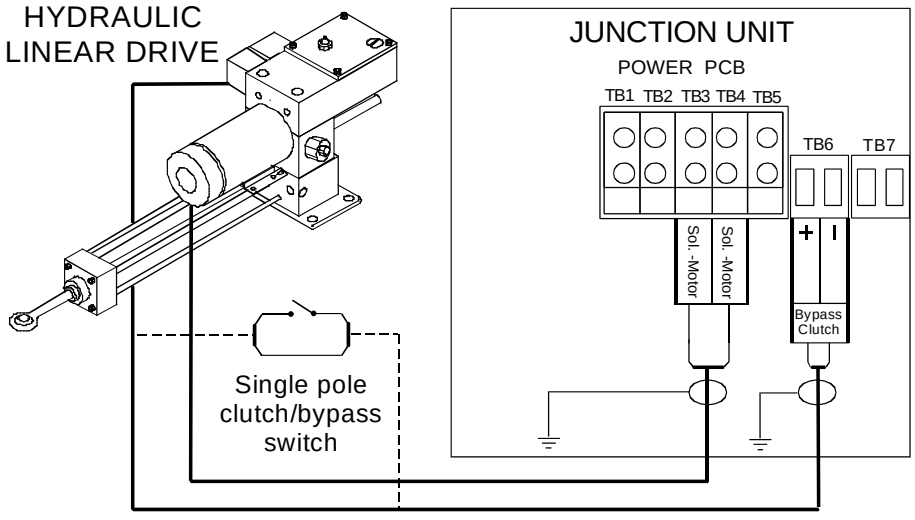


Figure 4-9 Connecting a hydraulic linear drive

Connecting a solenoid valve

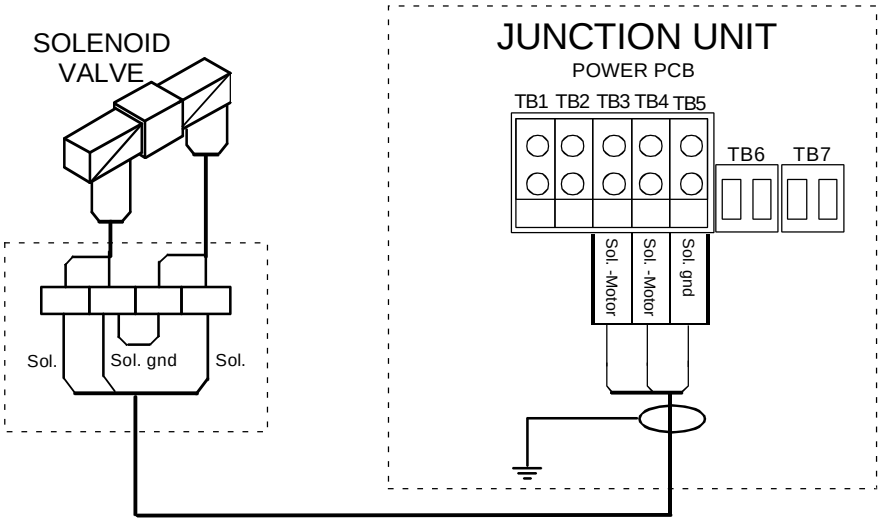


Figure 4-10 Connecting a solenoid valve

4.10 Control unit

Avoid mounting the control unit(s) where it is easily exposed to sunlight, as this will shorten the lifetime of the display.

Panel mounting

- Make a panel cut-out of 210x102 mm.
- Use the supplied fastening device to fasten the control unit to the panel. See Figure 4-11
- Connect the Robnet cables to the control unit connectors **(See note on page 54).**

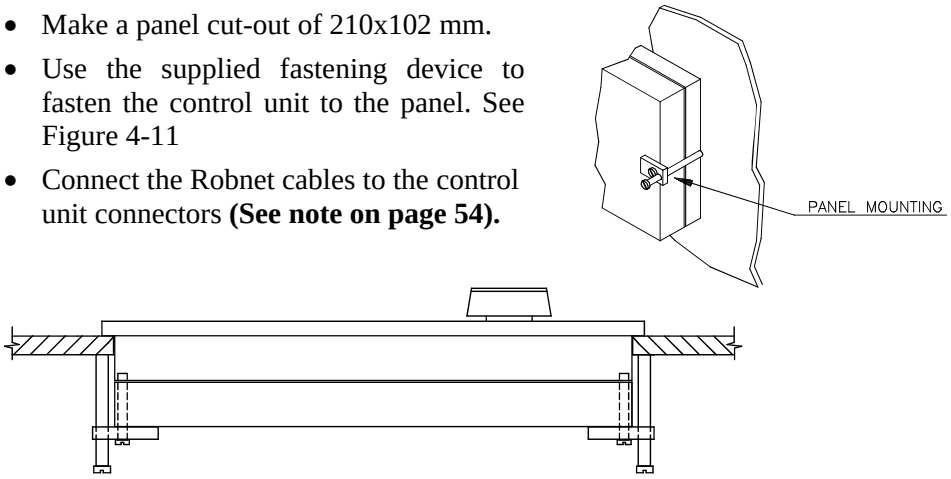


Figure 4-11 AP35 Panel mounting

Bracket mounting

- Mount the two bracket halves to the Control unit.
- Temporarily bolt together the other two halves of the bracket to the two other halves.
- Hold the Control unit in place by hand and mark the 4 holes for the fixing screws on the mounting surface.

- Remove the Control unit, drill the 4 mounting holes in the mounting surface.
- Unbolt the temporarily fitted bracket halves and screw them to the mounting surface.
- Assemble the complete bracket again and adjust the control head to best viewing angle and tighten up the mounting bracket bolts.
- Connect the Robnet cables to the control unit connectors **(See note on next page).**

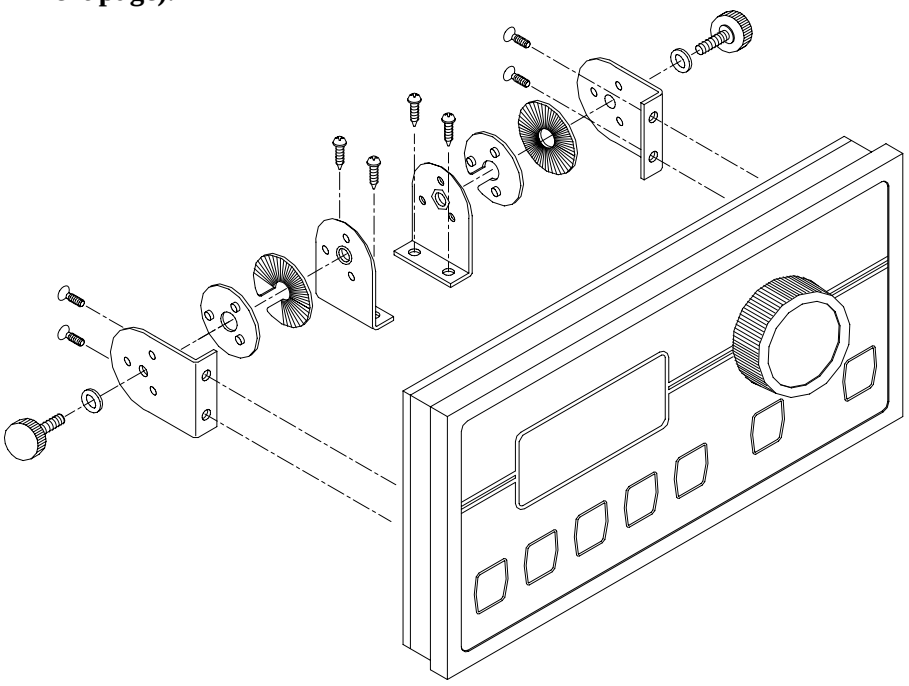


Figure 4-12 AP35 Bracket mounting

ROBNET network cables

As Robnet units have 2 Robnet connectors they can be used as "jack points" for further expansion of the system. There are no dedicated "in" or "out" connectors. You may connect the cables to any available Robnet connector on the specific unit.

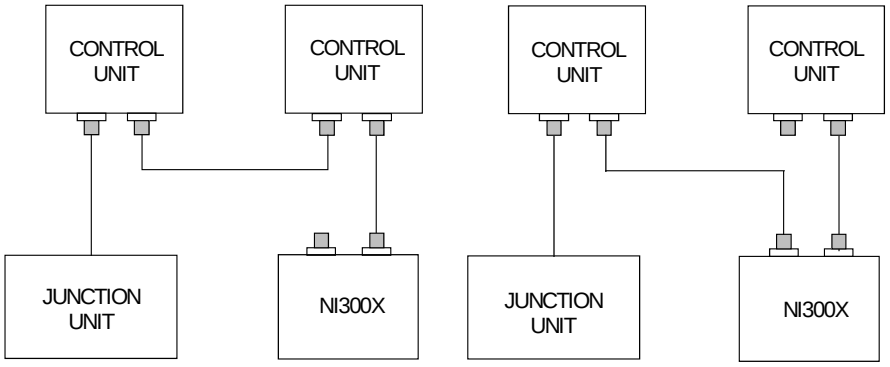
The Robnet cables are available in 7 and 15 m length and provided with 6 pin male connector at one or both ends. The 15 m cable to the junction unit has connector only at the control unit end.

Optional extension cable (10 m) is available and have a male and a female connector.

When installing a system, try to minimize total Robnet cable length by connecting all Robnet units to the nearest available Robnet connector.

Total length of Robnet cable installed in a system should not exceed 50 m (165').

Examples of interconnecting Robnet units:

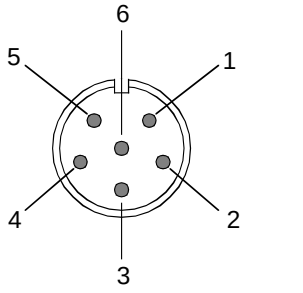


All connectors are crimp type, which can be easily dismantled if required in an installation where you can not drill holes as big as the connector is.

See table for pin configuration and color code of the network cable. DO NOT MIX THE PINS AND THE CABLE COLORS!

Note ! *Apply a thin layer of pure vaseline on the connector threads and make sure the connectors are properly secured to the receptacle by the coupling ring. The connectors are weather proof according to IP56, when properly installed. All unused Robnet plugs must be fitted with the plastic cap to keep the connector free of dirt and moisture. A separate screw cap for the Control unit comes as part of the installation kit.*

Cable pairs	Color code	Pin	Signal
1. pair	Pink	5	V SYSTEM+
	Grey	4	V SYSTEM–
2. pair	Brown	1	Bus–
	White	2	Bus+
3. pair	Yellow	3	On - Off
	Green	6	ALARM



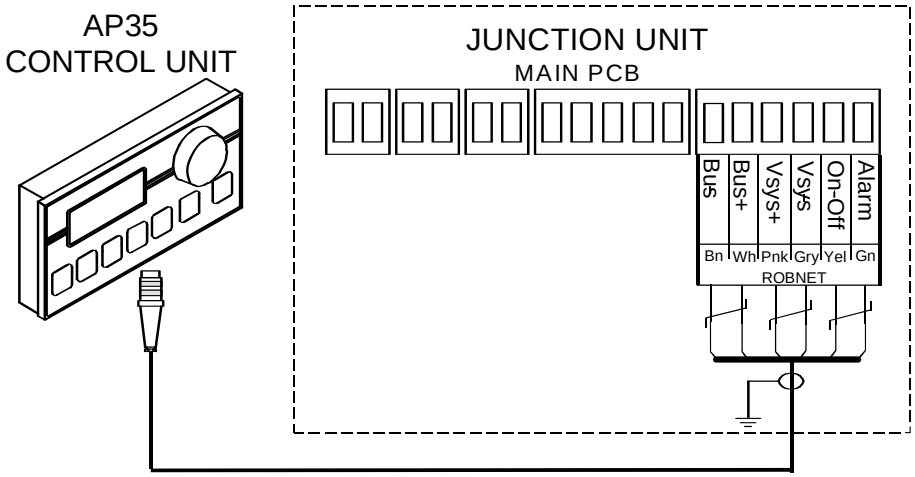
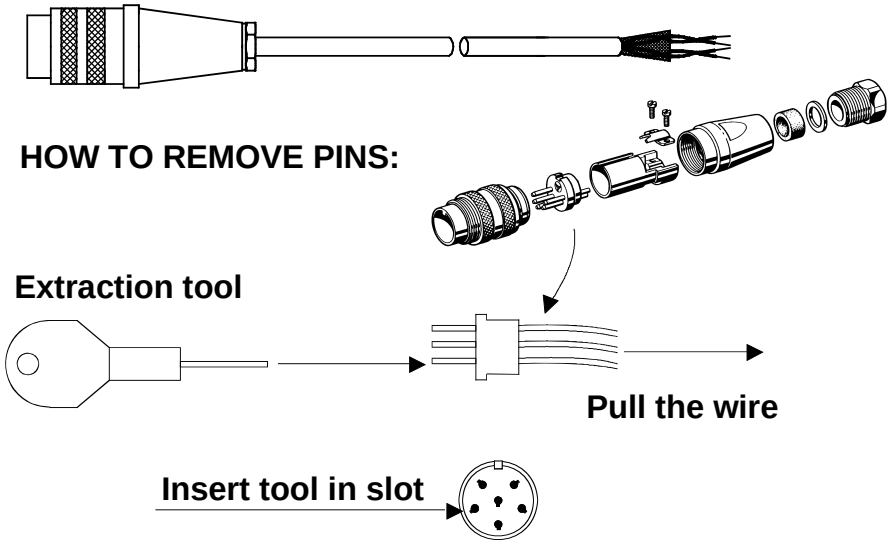


Figure 4-13 Control unit connection



Note ! *For installations that require special cable length, contact your Simrad distributor for information.*

4.11 RFC35 Fluxgate Compass

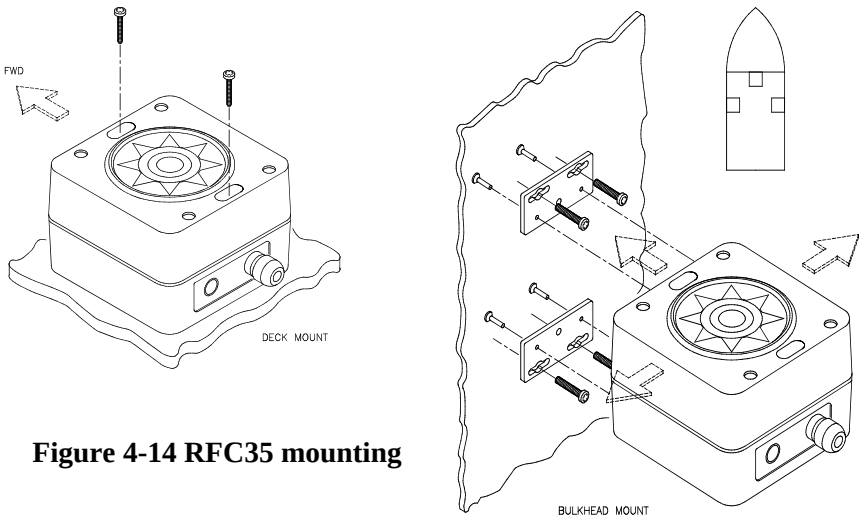


Figure 4-14 RFC35 mounting

The heading sensor is the most important part of the AP35 system and great care should be taken when deciding the mounting location. As the sensor heading is displayed on the AP35 Control Unit, the heading sensor can be mounted at any location where there is a minimum of magnetic interference.

Note ! *An autopilot heading sensor should not be installed on the fly bridge or in the mast.*

The RFC35 compass can be deck mounted or on the bulkhead, athwart ship or along ship. The heading offset feature in the AP35 will compensate for the mechanical offsets that may be a result of the selected location and orientation of the RFC35.

If the RFC35 is deck mounted or bulkhead mounted athwart ship with the cable gland pointing aft, little if any offset correction is required. With the cable gland pointing forward a 180° correction is required.

When mounting RFC35 on a bulkhead along ship, a +90° or -90° correction is needed dependent on whether it is a port or starboard bulkhead.

Select a location that provides a solid mounting place free from vibration, and as close to the vessel's centre of roll and pitch as possible, i.e. close to the water line. It should be as far as possible from disturbing magnetic influences such as the engines (min. 2 meters), engine ignition cables, other large metal objects and particularly the drive unit.

Use the supplied mounting kit and drill the holes through the centre of the slots in the sensor or the mounting brackets.

Note ! *The compass face plate on the RFC35 is the TOP. Never mount it upside down! Level the sensor as close to horizontal as possible.*

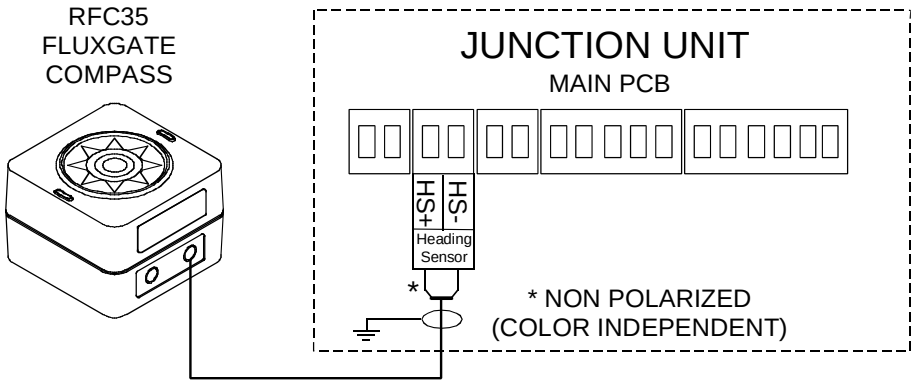


Figure 4-15 RFC35 connection

- Select RFC = J300X in the Installation : Interface Setup.
- Select RFC as compass in the User Setup Menu.

4.12 RC25 Rate Compass

The RC25 Rate Compass also contains a magnetic fluxgate sensor, which means you have to take the same precautions at installation as for the standard RFC35. On steel hull boats, however, it should be installed 1 meter above the steel deck to obtain optimum performance.

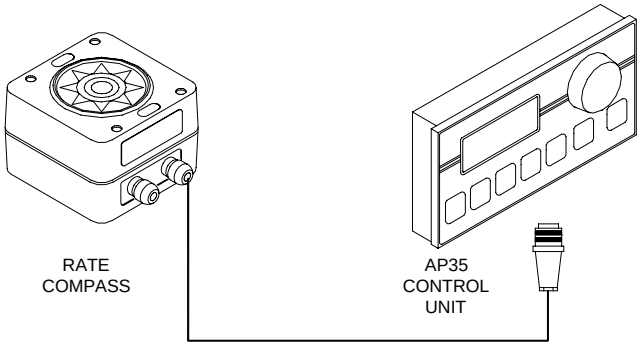


Figure 4-16 RC25 Connection to AP35 Control Unit

- Connect the Robnet connector to the AP35 Control Unit (or GI51 or NI300X if installed), see Figure 4-16.
- Alternatively, if there is no free receptacle, cut the connector from the cable and connect the wires in parallel with the wires going from the junction unit to the control unit (see Figure 4-13). *Do not connect the yellow and the green wires and ensure that they do not connect with the terminal or chassis.*
- Select RFC = ROBNET in the Installation : Interface Setup.
- Select RFC as compass in the User Setup Menu.
- Perform the compass calibration as described on page 82.

Note ! *After turning on, the compass will stabilize in less than 30 seconds, but it will need another 5 minutes to get the full effect of the rate sensor.*

Refer to page 82 to compensate for any permanent off-set after the calibration is completed.

RC25 calibration data is stored in the compass and will not be deleted by a Master Reset in the autopilot.

4.13 R3000X Remote Control

R3000X should be mounted in the supplied bracket that can be fixed by four mounting screws. The unit is weather proof and can be mounted outdoor.

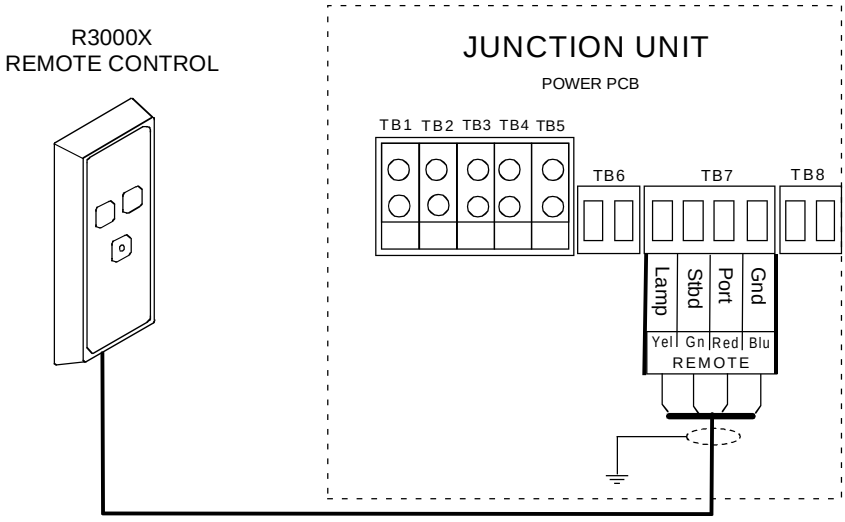


Figure 4-17 R3000X connection

4.14 FU50 Steering Lever

For connection of the FU50 Steering Lever, see the FU50 manual.

4.15 S35 NFU Steering Lever

The unit is mounted to bulkhead or panel by two screws from the front. The cable is connected to the junction unit according to Figure 4-18. Interchange the port and stbd wires to the screw terminals in the junction unit if necessary to make the direction of the lever movement coincide with the direction of the rudder movement.

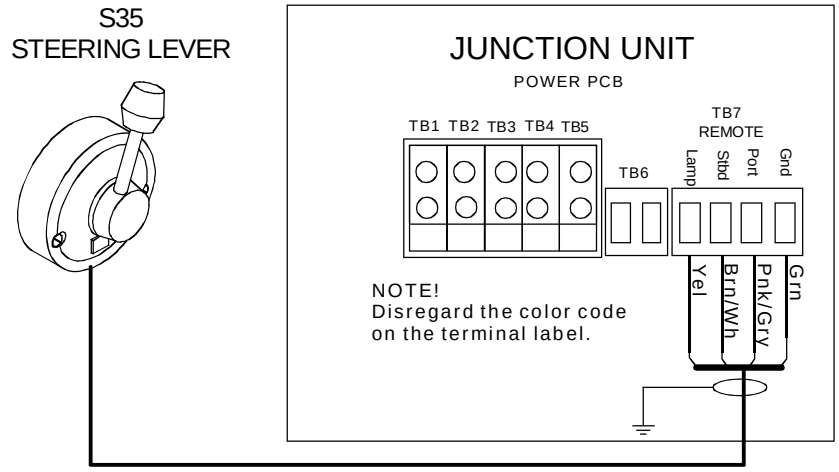


Figure 4-18 S35 connection to Junction unit

The unit is opened by removing the three screws on the back cover. Inside are two sets of micro-switches, a printed circuit board with a plug-in terminal, and a jumper strap.

4.16 F1/2 Remote Control

This handheld remote control with 10 m (30 ft.) cable is connected to the control unit as shown in Figure 4-19.

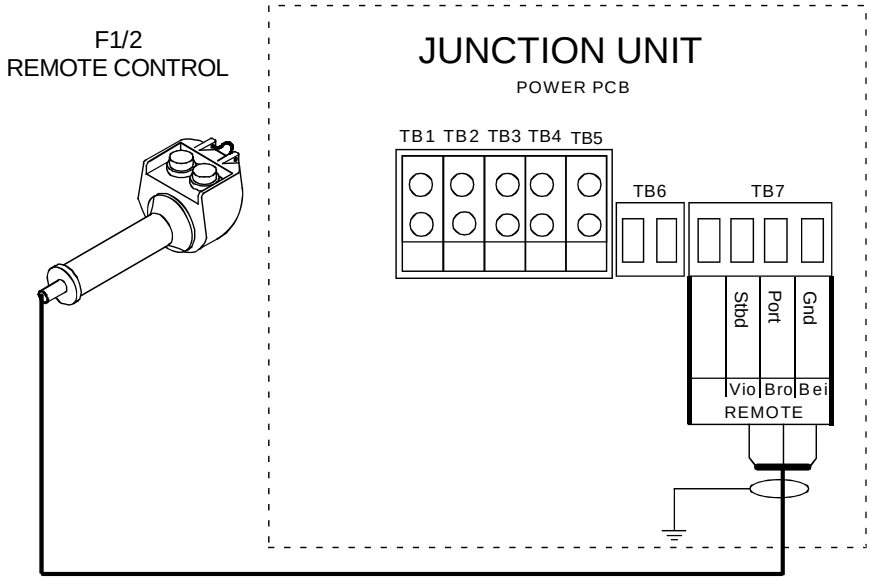


Figure 4-19 F1/2 connection

4.17 RI35 Mk2 Rudder Angle Indicator

The RI35 Mk2 is designed for flush, bulkhead or bracket mounting, and should be positioned in a location in clear view of the helmsman. Mounting of RI35 Mk2 is identical to the mounting of AP35 Control Unit; refer to page 52. When the location is determined, the cables should be connected to RI35 Mk2 before the unit is mounted.

The interconnection cables are screened, and the screen should be grounded in the autopilot junction unit. See Figure 4-20 for connections to the autopilot junction unit.

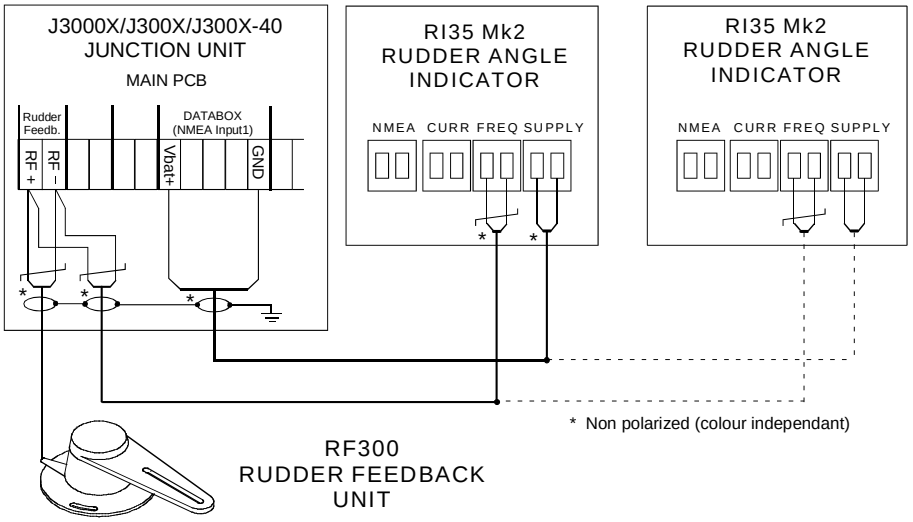


Figure 4-20 RI35 Mk2-J3000X/J300X Wiring diagram

RI35 Mk2 illumination

Internal LED's illuminates the scale. The illumination is turned on and adjusted in three steps by pushing the front panel keypad.

Zero adjust

Note ! *Prior to making a zero adjustment on the indicator, make sure the feedback unit is installed and aligned according to it's mounting instruction.*

Follow the instructions on page 81 to zero adjust the rudder feedback.

Press and hold the illumination key for 5 seconds. The pointer will now adjust itself to zero confirmed by a 1-second beep.

Note ! *There may be a difference in the RI35 Mk2 and the autopilot reading. This is normal because the autopilot zero adjust compensates for drag caused by the hull, flaps etc. If you prefer the readings to be aligned, then put the rudder amidships using the RI35 Mk2 as reference, and then zero adjust the autopilot.*

Reversed deflection

On installations where the rudder feedback unit is mounted upside down, the deflection of the pointer will be reversed. To make it correct, move the rudder to approximately 10° either way then press and hold the illumination key for 10 (ten) seconds. The pointer will then first travel to zero then continues to the opposite side of the scale confirmed by a 2-second beep.

Note ! *If you let go of key before confirmation of reversed deflection has been given, the RI35 Mk2 will think you meant to do a zero adjust and leave the pointer at zero. Then simply repeat the "Zero adjust" section.*

4.18 Interfacing

With the AP35 autopilot system there are several possibilities to connect to other equipment for data exchange:

1. J3000X includes a single NMEA input/output port.
2. J300X and J300X-40 includes two NMEA input/output ports (NMEA heading 10 Hz to port 2) and Clock Data interface to Simrad/Anritsu and Furuno radars.
3. The optional NI300X NMEA Interface (expansion) Unit with 4 additional NMEA input/output ports.

The NMEA output may also drive IS15 instruments directly.

The different connecting diagrams below illustrate the interface possibilities.

Note ! *Also see "Interface Settings" page 76.*

4.19 Single NMEA input/output

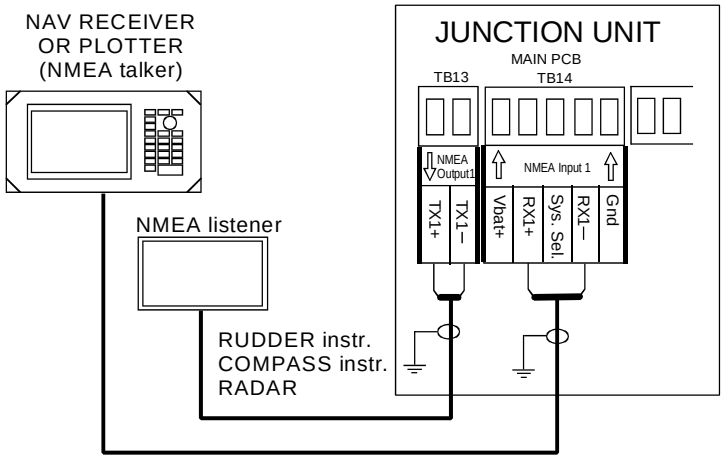


Figure 4-21 Single NMEA connection

4.20 Double NMEA input/output

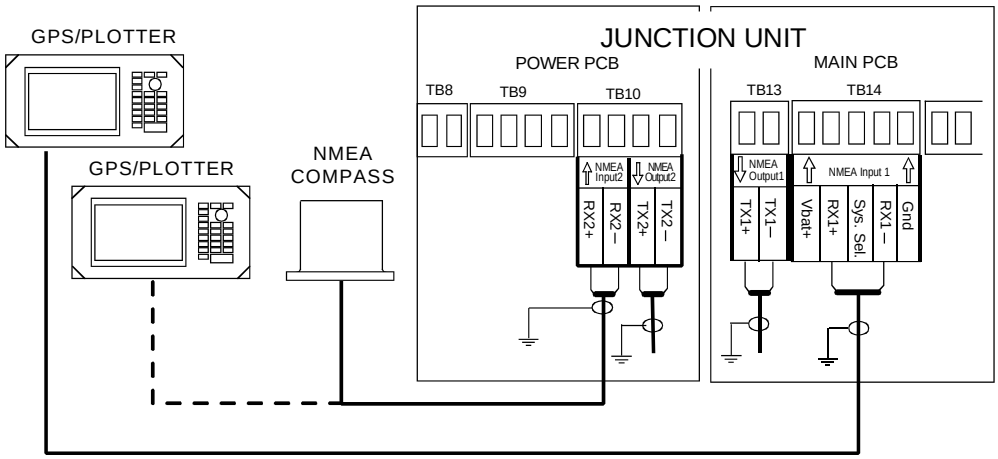


Figure 4-22 Double NMEA connection

4.21 Additional NMEA output on Port 2

Output signal	Output terminal	Output sentence
Continuous output of compass heading on 10 Hz (10x/sec.) NMEA format	Junction unit, Power PCB, NMEA2, TX2+, TX2–	HDT (True) or HDG (Magn.) depending on heading source.

4.22 Input from "NMEA Compass"

A gyro compass or GPS compass (or other) with NMEA 0183 HDT (or HDG, HDM message) is connected to the J300X/J300X-40 NMEA Input2 terminal.

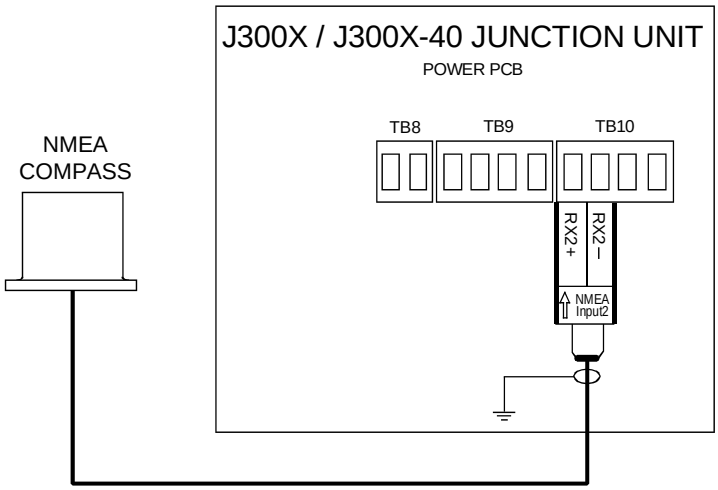


Figure 4-23 NMEA compass connection

4.23 Radar Clock/Data

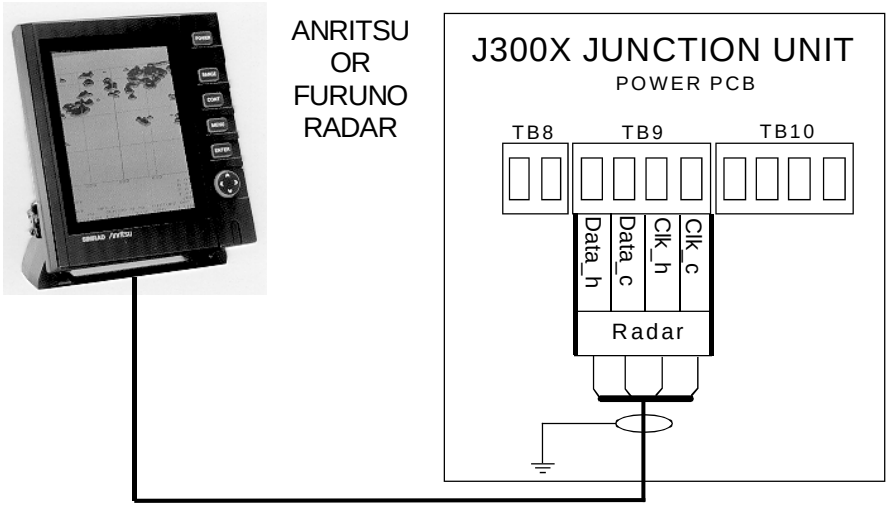


Figure 4-24 Radar Clock/Data connection

4.24 IS15 Instrument

For installation and operation of the IS15 instruments refer to separate manuals.

NMEA In

This connection will provide speed and depth input to the autopilot. If an IS15 Wind Transducer is connected to the system, wind information will also be transferred to the autopilot.

The connection is made by a Roblink cable from the instrument NMEA socket (4) to the J3xx Junction Unit Main Board, Terminal RX1+ and RX1-. See Figure 4-25.

NMEA Out

This will provide the instrument system with heading data.

The connection is made by a Roblink cable from J3xx Junction Unit Main Board, terminal TX1+ and TX1– to the instrument NMEA socket (4). See Figure 4-25.

You will need a minimum of two instrument heads to make the system both ‘listen’ and ‘talk’ (I/O).

If IS15 Expander is used in the instrument system, the NMEA connections are made to this unit. See Figure 4-26.

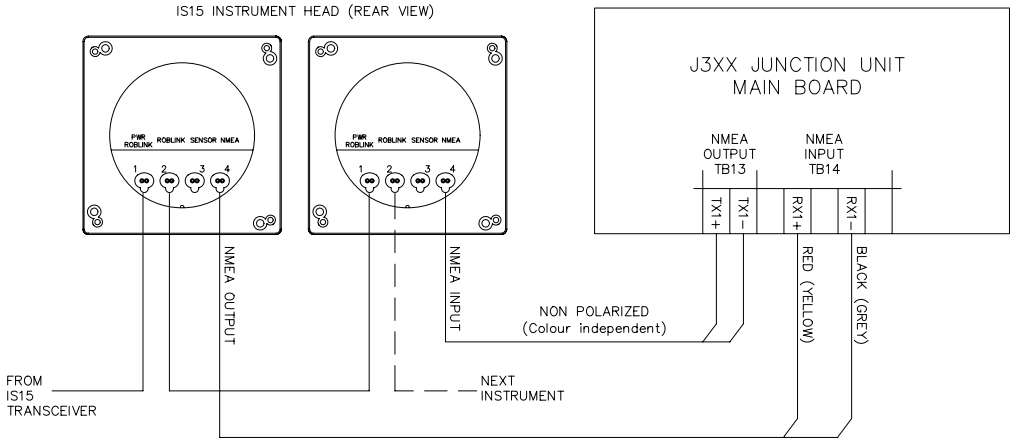


Figure 4-25 IS15 Instruments / J3XX Connection

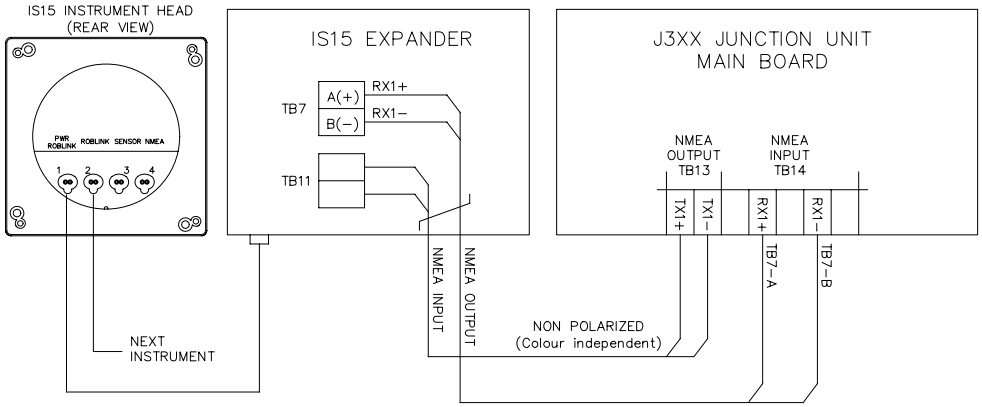


Figure 4-26 IS15 Expander / J3XX Connection

4.25 Analog Repeater

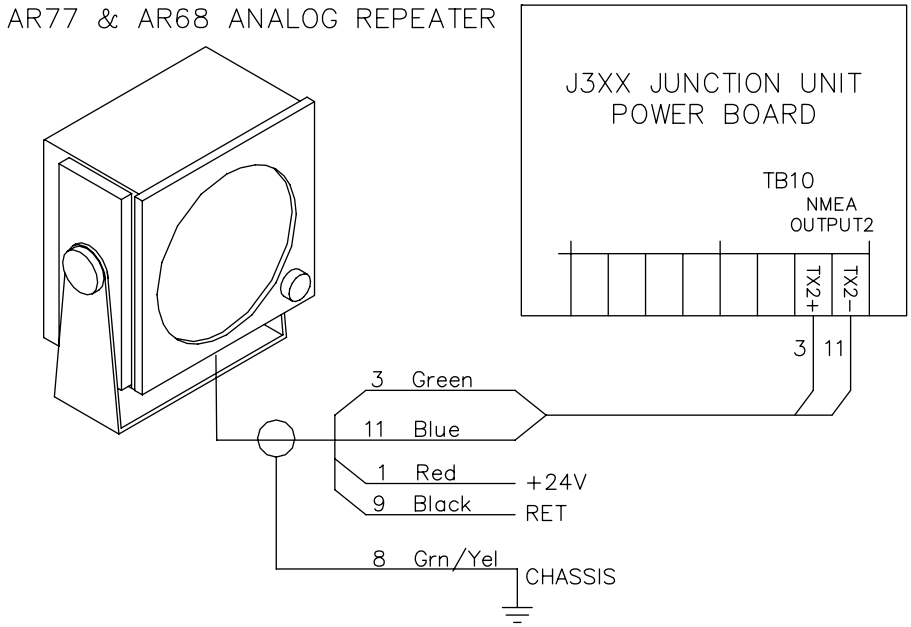


Figure 4-27 AR77 and AR68 Analog Repeater connection

4.26 Digital Repeater

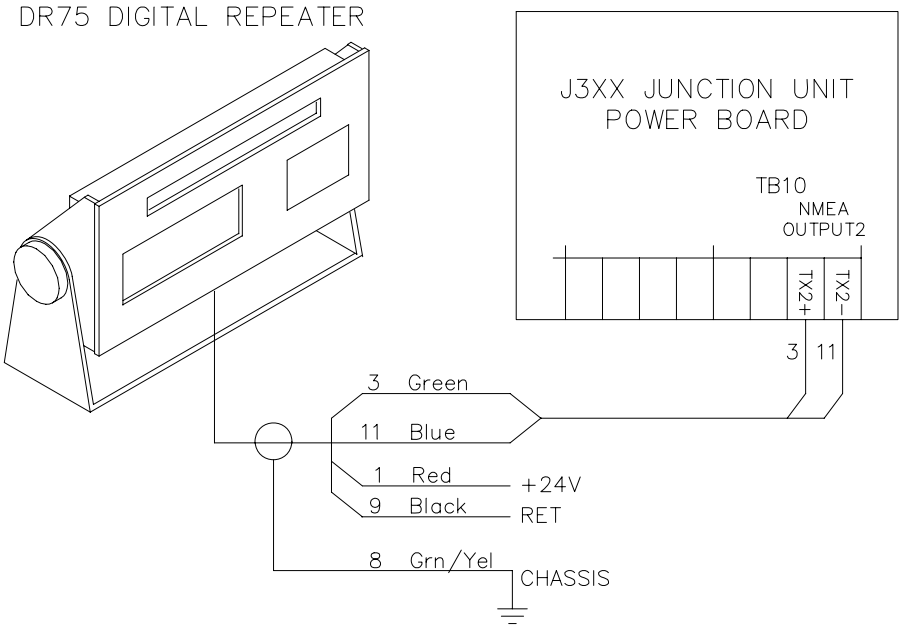


Figure 4-28 DR75 Digital Repeater connection

4.27 External Alarm

The external alarm circuit has an open collector output for an external alarm relay or buzzer. The alarm voltage is the same as the main supply voltage. Max. load on external alarm output is 0.9 Amp.

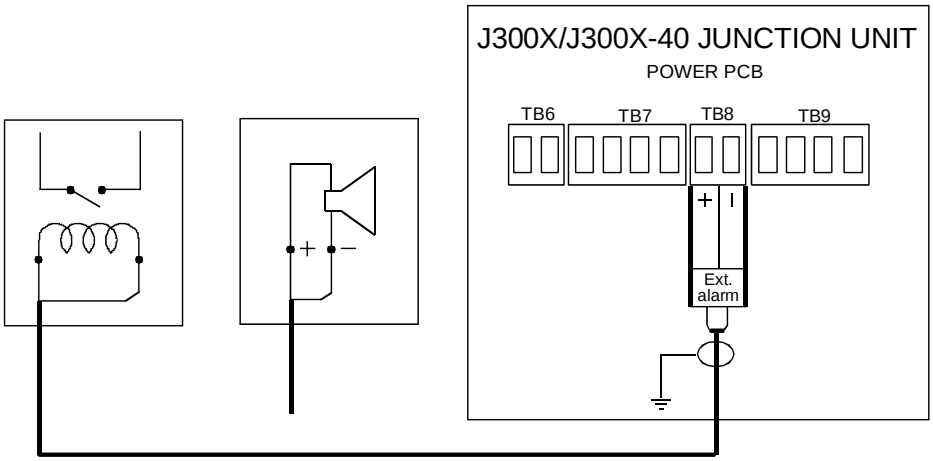


Figure 4-29 External alarm connection

4.28 NI300X NMEA Interface Unit

The NI300X is normally installed inside a console or locker close to Nav receivers, radar and instruments to keep cables short. The unit does not have controls that need to be operated during installation or use, but you should be able to take the lid off for inspections, to view LED indication of received signals. It should be installed with the cable inlet and the Robnet connectors facing down. The NI300X is designed to operate in a location that provides ambient temperatures below +55° C (+130° F). It is fastened to the panel/bulkhead by the external mounting brackets.

Note ! *The NI300X is not weatherproof, and must be installed in a dry location!*

The NI300X NMEA Interface (expansion) Unit is designed to handle installations where more NMEA lines have to be tied into the system. Four NMEA ports are available. An additional output data-port with DATA/CLOCK signal is capable of generating heading data in the format used by some radar displays made by Simrad/Anritsu and Furuno. This feature is thus added to the system if a J3000X Junction Unit is installed (J3000X has no radar Clock/Data output as compared to J300X and J300X-40).

Configuration for Simrad/Anritsu or Furuno is selected in the Installation Setup Menu.

12V out is for driving (max. 3) IS15 instruments (max 250mA load).

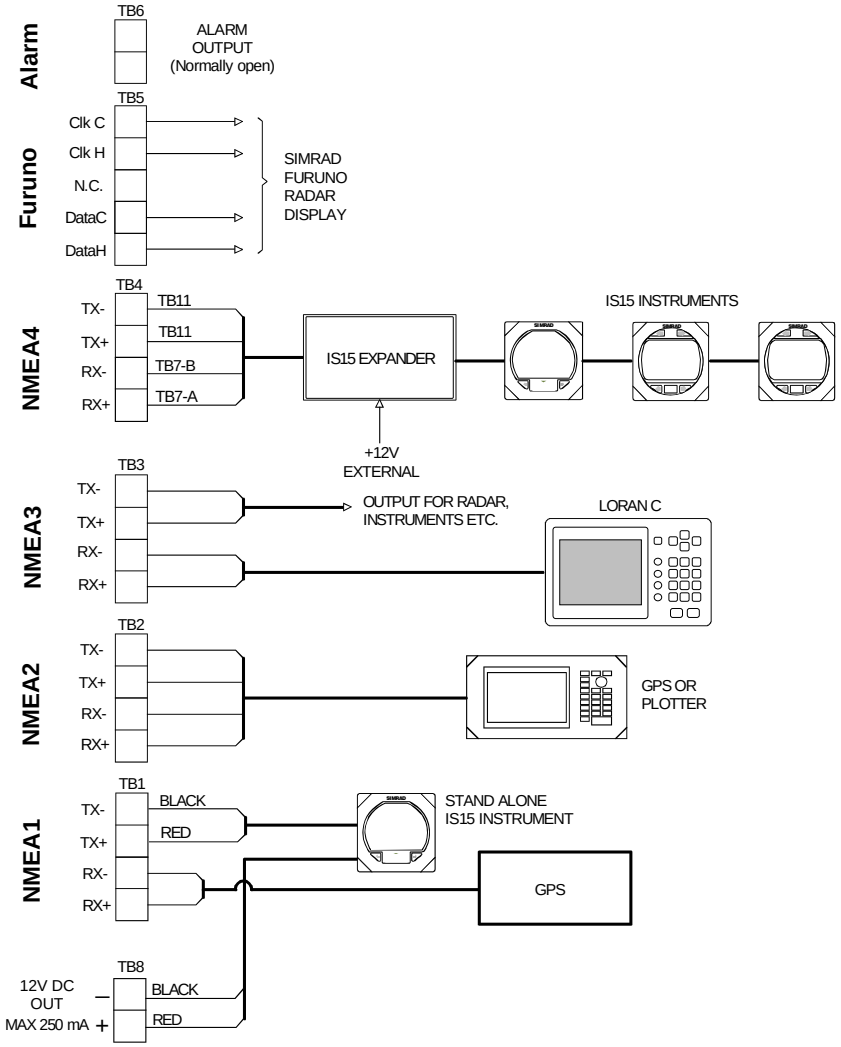


Figure 4-30 NI300X connection

The NMEA 1-4 ports are identical in HW and SW and can be connected as desired.

4.29 CI300X Compass Interface

CI300X is substituted by GI51 Gyro Interface.

4.30 GI51 Gyro Interface

Refer to separate GI51 Gyro Interface Manual for complete specifications and connection details.

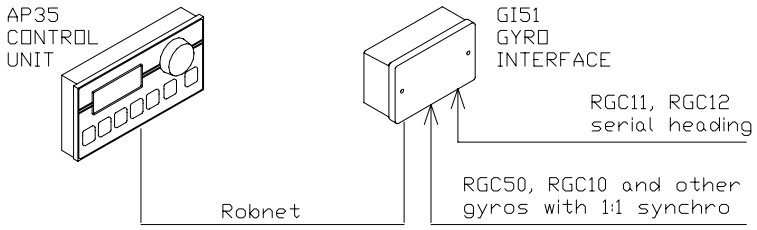


Figure 4-31 GI51 Robnet connection

Note ! *Gyros with stepper or geared synchro output can not be used when GI51 is connected to AP35 via Robnet. Then GI51 must be installed as a stand alone unit, using NMEA heading output to J3XX port #2.*

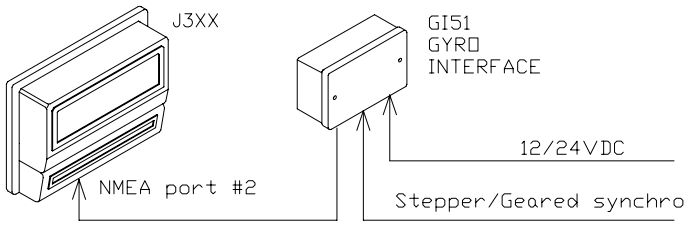
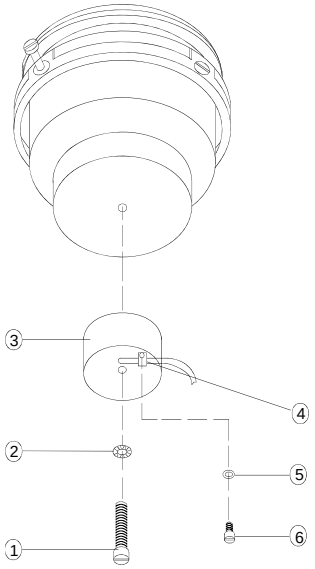


Figure 4-31A GI51 Alternative connection

Note ! *For heading offset and alignment, see GI51 Manual.*

4.31 CD100A Course Detector

On some installations the owner may prefer to use the boats own compass. The compass must be fully gimballed and have a flat surface underneath to fit the CD100A. Make hole for a 6 mm screw in the bottom of the compass and mount the CD100A as shown on the drawing. Secure the 6 mm screw through the centre hole of the CD100A. Make sure the cable does not prevent the compass from moving freely in the gimbals.



1	Screw M6x25mm, non magnetic
2	Washer, non magnetic
3	Course detector
4	Cable clamp, nylon
5	Washer, non magnetic
6	Screw M3x10mm, non magnetic

Note!
Lock nut on mounting screw (pos. 1) for transportation only. To be removed before mounting.

Figure 4-32 CD100A mounting

4.32 CDI35 Interface

Locate the CDI35 as close to the compass as possible so that there will be no problem finding it in the event of a service.

Put the two fixing screws in the slots and secure the unit to the bulkhead. Open the unit to access the screw terminals.

Connect the cables as shown on the diagram below.

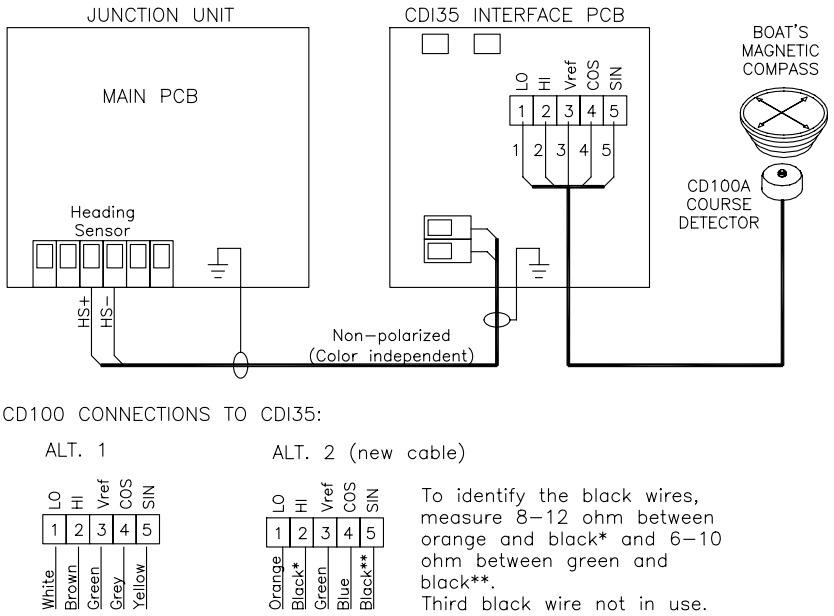

JUNCTION UNIT
MAIN PCB
Heading Sensor
HS+
HS–
CDI35 INTERFACE PCB
LO HI Vref COS SIN
1 2 3 4 5
1 2 3 4 5
BOAT'S MAGNETIC COMPASS
CD100A COURSE DETECTOR
Non–polarized (Color independent)
CD100 CONNECTIONS TO CDI35:
ALT. 1
LO HI Vref COS SIN
1 2 3 4 5
White Brown Green Grey Yellow
ALT. 2 (new cable)
LO HI Vref COS SIN
1 2 3 4 5
Orange Black* Green Blue Black**
To identify the black wires, measure 8–12 ohm between orange and black* and 6–10 ohm between green and black**.
Third black wire not in use.

Figure 4-33 CDI35 connection

Note ! *CD100 has a connector that has to be cut off the cable.*

4.33 Software Setup Procedure

Description of Installation Settings

The design of the AP35 includes advanced features that have simplified the installation and setup of an autopilot. The principle advantage is that manual adjustments that needed to be done on previous models are no longer necessary with the AP35.

Note ! *The installation settings must be performed as part of the installation of the AP35 system. Failure to correctly set the values in the installation settings may prohibit the AP35 from functioning properly!*

The Installation Settings are grouped into the following functional categories:

- Language: Selects language used for display information
- Dockside Settings: Sets values of items to be set prior to seatrials
- Interface Setup: Sets the identification of navigation and optional equipment connected to the AP35 system

- Seatrial Settings: Determines automatic calibrations and steering parameters
- View Parameters Permits viewing, setting, or changing steering parameters

Each group is designed to focus on specific functions related to an installation activity, and enable quick access when changes need to be made.

Some important points regarding the installation settings values:

- When the AP35 is delivered new from the factory, (AND ANY TIME AFTER A MASTER RESET OF MEMORIES HAS BEEN PERFORMED) the Installation Settings are all reset to preset (default) values. The warning message "Installation Setup Required" will appear at turn on and if an attempt is made to access the AUTO or NAV modes.
- The Dockside, Interface and Seatrial settings can only be accessed when the system is in STBY mode.
- The values that are selected (also referred to as "PARAMETERS") from within the Installation Settings Menu, are stored in the memory of the AP35 system. No specific action is required to "SAVE" the selected values. Once the value is changed, it is stored until the next time the menu item is selected and changed.
- The Installation Settings are considered global, enabling values to be available to all control units in the system.
- The values in the Seatrial Settings are dependent on successful completion of the Dockside Settings.

Before attempting to turn on the AP35 and perform an Installation Setup, the hardware installation and electrical installation must be completed in accordance with the installation instructions.

Installation Settings Menu

The Installation Settings Menu (ISM) is presented on the autopilot display by pressing and holding the NAV/SETUP pushbutton for 5 seconds.

Note ! *The INSTALLATION SETTINGS MENU is different from the USER SETUP MENU . Refer to flow diagram on the next page for a pictorial view of Installation Settings Menu .*

There are several actions that you can do once you have accessed the ISM:

- Answer YES to the question by rotating the course dial clockwise
- Proceed to the next item in the menu by pressing the STBD pushbutton. (Proceeding to the next item when presented with a question is the same as answering NO to the question.)
- Proceed back to the previous item in the menu by pressing the PORT button
- Change the selected item shown rotating the course dial
- Leave the ISM by selecting STBY, AUTO, WORK or NAV.

On new installations, and whenever a control unit, junction unit, or software is replaced in an AP35 system, it is recommended that a MASTER RESET be performed as described in the ISM prior to proceeding with the setup procedure.

When using the ISM refer to diagram "Installation settings Menu Flow Chart" on next page.

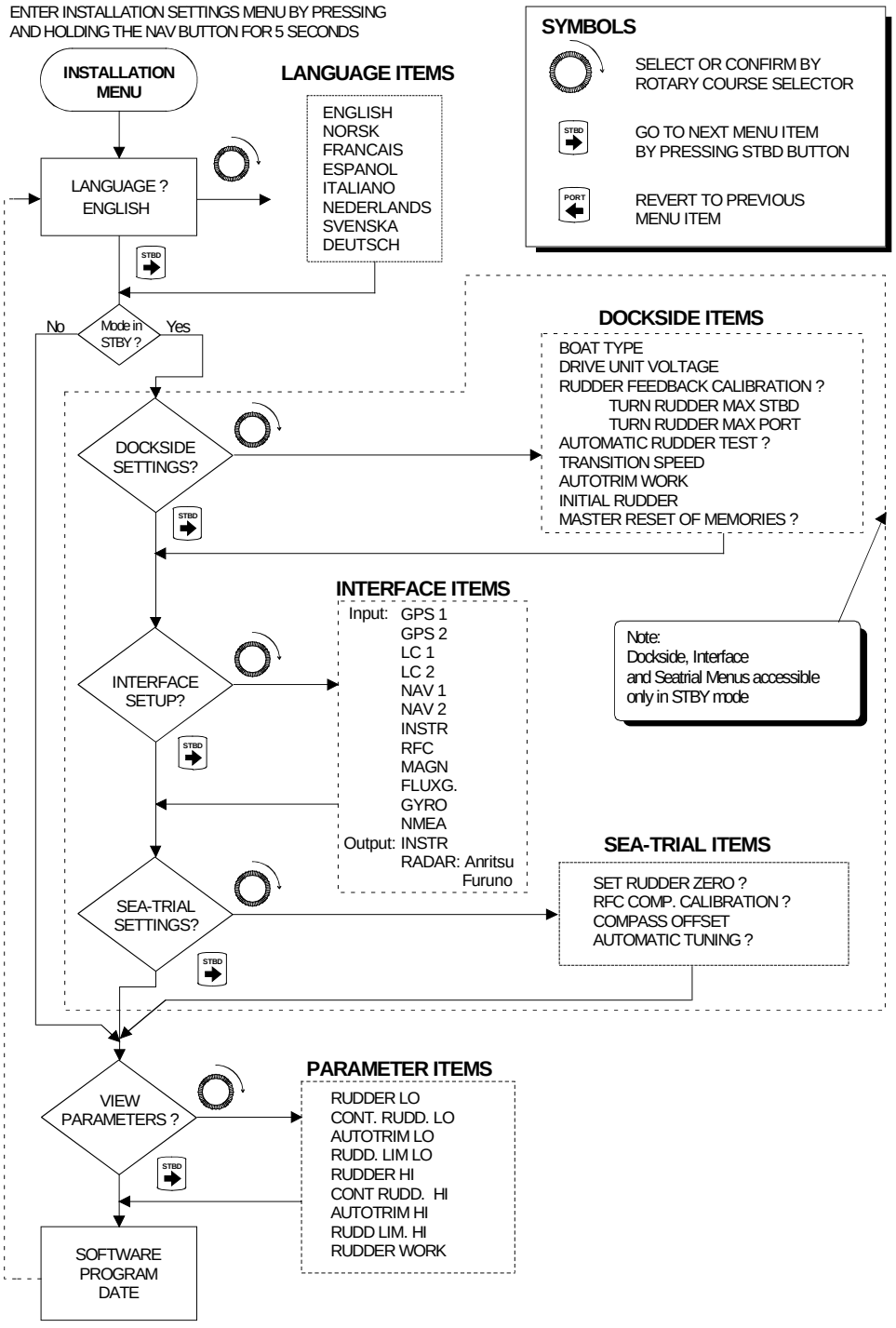


Figure 4-34 Installation settings menu

Language selection

The AP35 can present the display in eight different languages:

- English, Norsk, Francais, Espanol, Italiano, Nederlands, Svenska and Deutsch.

To access the language selection in the ISM:

1. Turn on the equipment and wait approx. 5 seconds.
2. Press the NAV/setup button for about 5 seconds until the display is changed to:

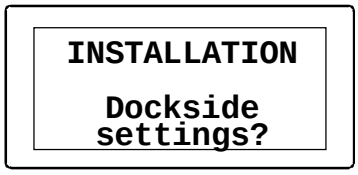
3. Turn the course dial until the language you wish to use is displayed.
4. Leave the ISM by a press on the STBY button, or continue to next item in the ISM by pressing STBD [>] button.

Dockside settings

The following menu items are accessible and can be set up in the Dockside Setup Menu:

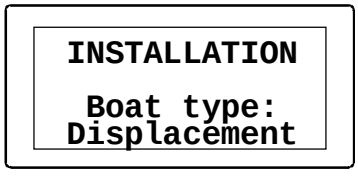
- Boat type
- Drive Unit voltage
- Rudder Feedback calibration
- Automatic Rudder test
- Transition Speed
- Autotrim work
- Master Reset of memories (only if required)

Enter the ISM as previously described. Go to "Dockside Settings" by pressing STBD [>] button.



To access the Dockside settings, turn the course selector clockwise.

The display will show:

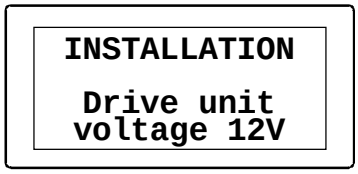


Actual boat type is selected by turning the rotary course selector. The options are: Displacement or Planing.

Type of boat will affect the steering parameters, and the functions available in the autopilot system. Select appropriate boat type and press STBD [>] button.

Drive unit voltage selection

This menu option requires the installer to set the drive unit voltage to the correct level. The selections are 12V, 24V or 32V and should be set to the voltage specified for your drive unit.



Note !

Selection of improper voltage level for your drive unit may damage both the drive unit and junction unit even if the protection circuits in the junction unit are activated.

Refer to the drive unit table on page 49 for information. It is not possible to select a higher voltage than the input voltage. The CLUTCH/BYPASS voltage is automatically set to the same as the drive unit voltage. In Rudder Test, the AP35 system will also automatically detect whether the drive unit is a reversible motor or solenoid operated.

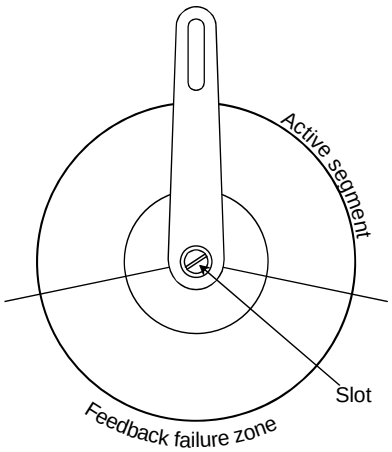
To change the voltage selection, rotate the course selector.

Proceed to next menu item by pressing STBD [>] button.

Alignment for RF45X Rudder Feedback Unit

The purpose of this procedure is to find the zero point and make the feedback unit operate within its active segment. If the unit operates outside this segment there will be a feedback failure alarm.

1. Position the rudder amidships.
2. Loosen the two screws that secure the transmission lever to the RF45X shaft.
3. Turn on the autopilot and wait until the display shows “SETUP REQUIRED” (see note below).



4. Press the STBY button again if necessary to read the rudder angle display (You may also access the User menu and the SYSTEM DATA menu item to read the rudder angle).
5. Use a flat screwdriver in the slot and adjust the rudder angle to zero degrees on the display.
6. Secure the transmission lever to the shaft and proceed with the '*Rudder Feedback Calibration'*.

Note ! *If the autopilot presents you with a Rudder Feedback Alarm after turn on, proceed as follows:*

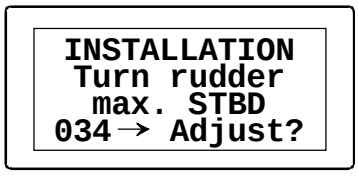
- *Turn the autopilot off. Use a flat screwdriver in the slot and turn the shaft 180°.*
- *Proceed from paragraph 3 above.*

Rudder Feedback Calibration

This function enables you to compensate for any non-linearity in the mechanical transmission between rudder and Rudder Feedback Unit.

Confirm by rotating the course selector clockwise. The display may now show:

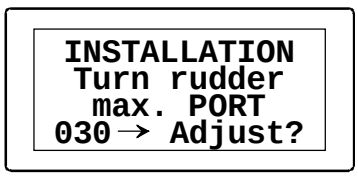
Manually turn the helm wheel to starboard until the rudder stops at maximum starboard rudder.



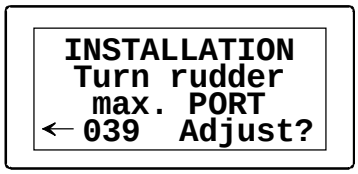
The value shown on the display is the value read by the feedback unit before any adjustment is made. The arrow indicates to which side the rudder is positioned. If the displayed angle is different from the actual angle, set correct rudder angle on the display by turning course selector clockwise to increase the value or counter clockwise to decrease the value.

Note ! *If the rudder feedback is mounted upside down, the displayed rudder angle may be to the wrong side before you start the adjustment (arrow pointing to Port).*

Advance to the next step by pressing the STBD [>] button



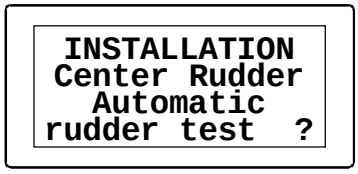
Manually turn the helm wheel to port until the rudder stops at maximum port rudder.



Adjust the displayed angle the same way as for starboard adjustment. (This time you need not correct for wrong side if the Rudder Feedback is upside down).

Note ! *Rudder zero may still be wrong but will be adjusted later during Sea Trial.*

Proceed to next menu item by pressing STBD [>] button.



The display will alternate between Center Rudder and current rudder angle as long as the rudder is more than 10° out of midship.

Automatic Rudder Test

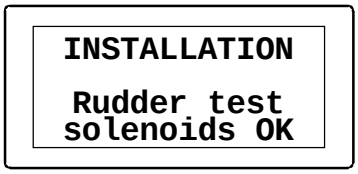
Note ! *Move the rudder manually to midship position before starting the test. It is important also that if the boat uses power assist steering, that the engine or electric motor used to enable the power assist steering be turned on prior to this test.* ***Stand CLEAR of the wheel and do not attempt to take manual control of the wheel during this test!***

Activate the automatic rudder test by turning the course selector clockwise.

The AP35 will issue a series of PORT and STBD rudder commands and automatically verify correct motor direction, and reduce the rudder speed if it exceeds the maximum acceptable speed for autopilot operation.

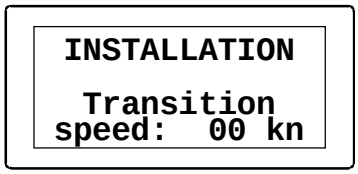
When test is finished the display will read:

or



Proceed to next menu item by pressing STBD [>] button.

Transition Speed



The transition speed is the speed where the AP35 will automatically change the steering parameter set from the HI speed to LO speed parameters, or vice versa.

The default setting of transition speed is zero, which requires that steering parameter selection be done manually. If a GPS, Loran, or external speed log input (from IS15 or other instrument systems) is connected, it is recommended to set the transition speed to a value greater than 0, to enable the automatic speed selection feature in the AP35.

It is recommended that you set the transition speed to a speed that represents the speed where the hull begins to plane, or where you would manually change the parameters from HI to LO.

The speed used for the automatic transition is obtained as follows:

1. Data from the source set in the interface setup for the INSTR channel. If this is a valid source of VHW (speed through the water) data, then this data is used for determination of when to change parameter sets.
2. If VHW data is not available from the INSTR channel or if the INSTR channel is not cond, the AP35 system will use the speed data obtained from the VTG (speed over ground) sentence received from the currently selected POS source.

If no speed data is available on either the INSTR channel (VHW) or the POS source (VTG), manual speed selection is required. The AP35 will always default to the HI speed steering parameters when the system is first turned on, and with speed data failure.

If manual speed selection occurs (the user manually selects HI or LO parameters), the manual parameter set will remain in effect until the AUTO mode is re-selected.

Rotate the course dial clockwise until the transition speed is set to the desired value in knots.

Proceed to next menu item by pressing STBD [>] button.

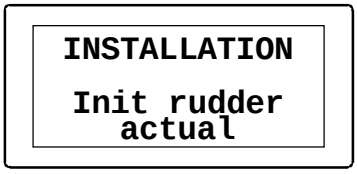
Autotrim WORK

The Autotrim parameter can be permanently switched off in the WORK mode. If the Autotrim is set to ON, it is automatically switched off when the speed is below 2 kts. (Ref. page 21). Rotate the course dial to select between ON and OFF.

Proceed to next menu item by pressing STBD [>] button.

Initial Rudder

When Actual is selected, the autopilot will use the current rudder position as midship reference (bumpless transfer) when switching from Stby to Auto or Nav. (or Dodge).



When Midship is selected the autopilot will use zero degrees as midship reference. Hence, the rudder will always move to midship when switching from Stby (or Dodge) to Auto or Nav mode.

Master reset

Note !

A Master Reset is part of the final test at factory and will reset the memories to factory settings. Unless you need to clear all stored values during the installation setup procedure, you should not perform a Master Reset.

If Master Reset is performed, Dockside settings must be done again, as well as Interface- and Seatrial settings. If an RFC35 or RC25 is connected, the compass must be re-calibrated!

The Master Reset needs a double confirmation to prevent an unwanted reset. To perform a Master Reset, rotate the course selector clockwise and observe the display; then rotate the course selector counter clockwise.

Interface Settings

The AP35 system provides a totally flexible approach to the input of data from heading sensors and other peripheral equipment. Identification of the type of equipment connected to the AP35 system is performed in the Interface Setup Menu.

If your system includes connection of external equipment to the NMEA0183 data ports in Junction Unit or NI300X, or if the GI51 is installed with optional compass units or an optional analog wind vane unit, they must be configured under this menu. This procedure allows you to assign an abbreviated name to identify the type of equipment that is connected to each of the available hardware ports in the AP35 system.

Abbreviated name	Equipment / Usage	NOTES
GPS1	Primary GPS	Can be used as either NAV source or POS source. Also for VTG data for automatic AUTO HI/LO speed selection
GPS2	Backup GPS	
LC 1	Primary Loran	
LC 2	Backup Loran	
NAV1	Chart plotter	
NAV2	Other Nav source	
INSTR	Source of data for automatic HI/LO parameter selection	Uses log input (VHW) for speed data
RFC	For use when selecting between Simrad fluxgate compasses	RFC35 fluxgate compass is connected to J3xx junction unit. RC25 rate compass is connected to Robnet
MAGN	Magnetic compass with course detector (CD100A)	CDI35 + CD100A is connected to J3xx junction unit.
FLUXG	For use with non-Simrad fluxgate compasses that output SIN/COS	Via previous CI300X.
GYRO	For use with Simrad RGC50, RGC10 and RGC11 gyro if using 1:1 synchro or RGC serial data	Via GI51 Gyro Interface
NMEA	For use with NMEA compasses	Gyro, THD, or other.
Output INSTR	NMEA output of compass heading	HDG or HDT output increased from 1 to 5 times/sec. on TX1 port
Output RADAR	Clock/data heading output to radars	Selectable between Simrad/Anritsu and Furuno. (On both J300X and NI300X)

Note ! *If using J300X, TX2 outputs HDT or HDG at 10 Hz constantly.*

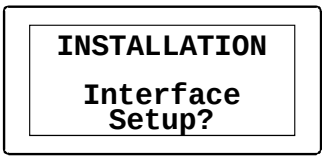
The Interface Setup Menu presents these names so that they can be assigned to a hardware input or output port. Each abbreviated name is then presented in appropriate locations of the USER SETUP MENU to provide the user with choices of data sources, or identified to the AP35 where to look for various types of data.

When you assign a hardware port to an abbreviated name, you are simply telling the AP35 system that when the user chooses an abbreviated name as a data source it should look to the hardware port assigned to the abbreviated name for the data.

Upon completion of the ISM it is recommended to record the configuration in the Interface Setup Table on page 78.

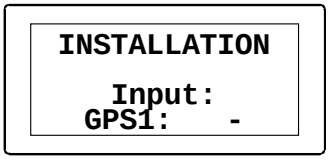
- Enter the Interface Setup part of the ISM.
- Scroll through to the Interface setup ? prompt by pressing the STBD [>]

The following display will be presented:



To access the Interface Setup items, turn the course selector clockwise.

The display will show:



The display is now showing the first name on the list. Assign a hardware port to the name by turning the course selector until the hardware port is displayed.

Proceed to the names on the list that shall be assigned by pressing STBD [>] button. Select appropriate NMEA ports by turning the course selector, or exit from menu by stepping through the list of names by pushing STBD [>] button.

Note ! *At the completion of the Interface Setup, the names of items that you have assigned hardware ports to will be available as sources of data for NAV (navigation), POS (position) and COMPASS in the USER SETUP MENU. It is recommended that you access the User Setup Menu directly after completing the Interface Setup to select the desired data. Refer to page 25 for details on changing the items in the User Setup Menu.*

Interface setup - input signal

Setup item (abbrev. name)	Equipment connected	Connected to terminal (use one available from list)	Assign hardware port to setup item (* = default setting)
GPS1		Not connected	–
		J3XX, Main PCB NMEA I/P RX1+,RX1–	J300X-1 * (on J3000X)
		J300X, Power PCB NMEA I/P RX2+,RX2–	J300X-2 * (on J300X and J300X-40)
		NI300X, NMEA port #1	NI300-1
		NI300X, NMEA port #2	NI300-2
		NI300X, NMEA port #3	NI300-3
		NI300X, NMEA port #4	NI300-4
GPS2		Not connected	– *
		J300X, Main PCB NMEA I/P RX1+,RX1–	J300X-1
		J300X, Power PCB NMEA I/P RX2+,RX2–	J300X-2
		NI300X, NMEA port #1	NI300-1
		NI300X, NMEA port #2	NI300-2
		NI300X, NMEA port #3	NI300-3
		NI300X, NMEA port #4	NI300-4
LC1		Not connected	– *
		J3XX, Main PCB NMEA I/P RX1+,RX1–	J300X-1
		J300X, Power PCB NMEA I/P RX2+,RX2–	J300X-2
		NI300X, NMEA port #1	NI300-1
		NI300X, NMEA port #2	NI300-2
		NI300X, NMEA port #3	NI300-3
		NI300X, NMEA port #4	NI300-4
LC2		Not connected	– *
		J300X, Main PCB NMEA I/P RX1+,RX1–	J300X-1
		J300X, Power PCB NMEA I/P RX2+,RX2–	J300X-2
		NI300X, NMEA port #1	NI300-1
		NI300X, NMEA port #2	NI300-2
		NI300X, NMEA port #3	NI300-3
		NI300X, NMEA port #4	NI300-4
NAV1		Not connected	– *
		J3XX, Main PCB NMEA I/P RX1+,RX1–	J300X-1
		J300X, Power PCB NMEA I/P RX2+,RX2–	J300X-2
		NI300X, NMEA port #1	NI300-1
		NI300X, NMEA port #2	NI300-2
		NI300X, NMEA port #3	NI300-3
		NI300X, NMEA port #4	NI300-4

J3XX = All junction unit models

Setup item (abbrev. name)	Equipment connected	Connected to terminal (use one available from list)	Assign hardware port to setup item (* = default setting)
NAV2		Not connected	– *
		J300X, Main PCB NMEA I/P RX1+,RX1–	J300X-1
		J300X, Power PCB NMEA I/P RX2+,RX2–	J300X-2
		NI300X, NMEA port #1	NI300-1
		NI300X, NMEA port #2	NI300-2
		NI300X, NMEA port #3	NI300-3
		NI300X, NMEA port #4	NI300-4
INSTR		Not connected	–
		J3XX, Main PCB NMEA I/P RX1+,RX1–	J300X-1*
		J300X, Power PCB NMEA I/P RX2+,RX2–	J300X-2
		NI300X, NMEA port #1	NI300-1
		NI300X, NMEA port #2	NI300-2
		NI300X, NMEA port #3	NI300-3
		NI300X, NMEA port #4	NI300-4
RFC		Not connected	–
	RFC35	Junction unit: HS+, HS–	J300X *
	RC25	Connection to ROBNET	ROBNET
MAGN		Not connected	– *
	CDI35+CD100A	Junction unit: HS+, HS–	J300X
FLUXG		Not connected	– *
		Previous CI300X Analogue terminal	CI300X
GYRO		Not connected	– *
	Simrad gyros	GI51 Gyro terminal	CI300X
NMEA	NMEA compass	J300X, Power PCB NMEA I/P RX2+,RX2–	J300X-2

J3XX = All junction unit models

Interface setup - Output signal Port 1

Setup item	Output signal	Output terminal	Select option (* = default setting)
Output INSTR	NMEA output of compass heading	Junction unit, Main PCB, NMEA, TX1+, TX1–	J300X-1 * 5x/second – 1x/second
Output RADAR	Clock/data heading output to radars	J300X, Power PCB, TB9	Simrad/Anritsu* Furuno

Note 1: *The standard NMEA output rate is 1x/second. When Output INSTR is set to J300X-1 (default), the output port, TX1, will have an output rate of 5x/sec. for HDG or HDT (heading) messages. The RSA (rudder angle) message is always 5x/sec.*

Note 2: *NMEA OUTPUT 2 on J300X has a constant output rate of 10x/sec. for HDG or HDT. Both port 1 and 2 are still sending HDM at 1 Hz. HDM is an obsolete sentence but some older equipment may still use it.*

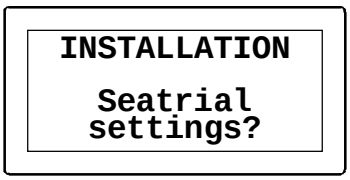
4.34 Sea Trial

The Sea-trial menu can only be accessed if the Dockside Settings are done and confirmed. It is also recommended that the Interface Setup be performed prior to Seatrial settings.

The seatrial settings do the following:

- Rudder zero adjust (To tell the AP35 the precise midships position of the rudder)
- Compass calibration (To automatically compensate for onboard magnetic Deviation)
- Compass Offset (To offset the final compass heading readout)
- Automatic tuning (An optional method of determining the steering parameters)

Advance through the ISM until the following display is presented:



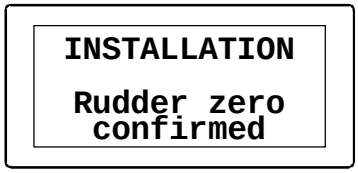
Confirm by rotating the course dial Clockwise.

Rudder zero adjust

The adjustment should be made in calm sea and side forces from wind or current should be avoided.

- Bring the boat up to cruising speed, and head directly into the wind.
- If the boat has twin engines, synchronize the engine RPM's.
- Set the trim tabs and stabilizers to have no effect on the boats heading.
- Steer the boat manually on a steady course.
- Confirm the rudder ZERO position by rotating the course selector clockwise.

The display will then show:



Press STBD [>] to proceed to next menu item.

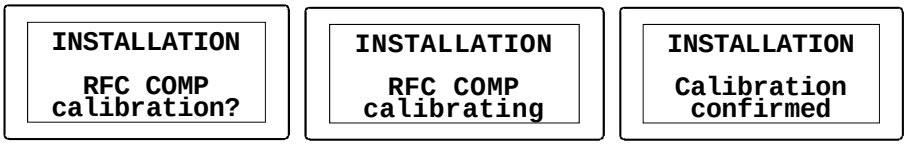
Compass calibration

This function will activate the automatic compass calibration procedure.

Note ! *The GI51 Gyro Interface is pre-calibrated for Simrad RGC gyro compasses. When other gyro compasses with synchro 1:1 is connected to GI51, it is recommended to perform the automatic compass calibration in order to calibrate the GI51 Interface/input signal.*

Before you begin the compass calibration procedure, make sure you have enough open water around you to make a full clockwise turn with the boat. Let the boat turn at idle.

The calibration should be done in calm sea conditions and with minimal wind to obtain good results.



1. Begin turning the boat to starboard.
2. Start compass calibration by turning the course selector clockwise.
3. When the calibration is completed, (after having completed approximately 1 1/4 turns), it will be confirmed in the display.

If the compass is close to disturbing magnetic objects, the compass calibration may fail, and the display will show:

In that case move the compass to a better location and re-calibrate.

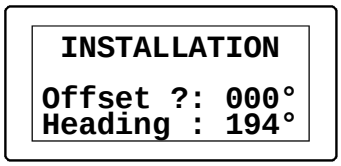
After calibration, check the compass readout against a known reference, other compass or leading line. If the reading is correct (+/-3°) except for a fixed offset, use the COMPASS OFFSET setting to input a fixed correction to the heading readout. Press STBD [>] button to proceed to next menu item.

Note ! *If an optional NMEA compass from Simrad or other manufacturer is installed, refer to the optional compass manual regarding calibration.*

Compass Offset

The compass OFFSET feature allows you to correct for a constant compass heading offset, that may be present as a result of the RFC35 being installed with a lubber line offset or a fixed offset remains after the calibration procedure has been completed. The value of compass offset is specific to the heading sensor that is selected at the time the offset is entered. (For multiple heading sensor offset procedure, choose Compass in User Setup. Refer to User Set-up Menu, page 25. Then re-enter Installation, Compass Offset, and set the required offset for chosen compass, or refer to separate GI51 manual).

The following display is presented when accessing the COMPASS OFFSET entry screen:



Dial in the correction by turning the course dial to offset the RFC35 heading to agree with the known, accurate heading. The offset value can be either positive or negative.

Note ! *If an OFFSET still exists after having accounted for the mechanical offset, one of the following problems may still exist:*

- The heading reference that you are comparing the RFC35 is not accurate.
- The automatic calibration obtained by the RFC35 is not correct, and may be due to a large magnetic influence near the RFC35. (A relocation may be needed.)

Caution ! ***Do not compare with GPS' COG since your GPS is showing course (over ground) and not heading.***

Proceed to the AUTOTUNE function by pressing the STBD [>] button, or return to STBY mode.

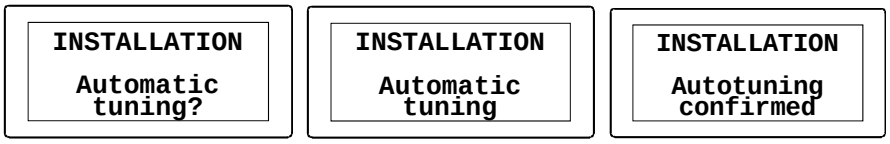
Automatic tuning

AUTOTUNE is a dynamic function that enables the AP35 system to automatically set up the two main steering parameters (Rudder and Counter Rudder) for the boat. The scaling factors of the parameters are also set automatically as a function of the boat type selection performed in the Dockside Settings menu.

Note ! *Autotune is an optional procedure that is not required for the AP35 to function. The AP35 is preset with steering parameters that should steer most boats in the 30 - 50 foot range and Autotune may not be required if the preset parameters steer your boat acceptably.*

Recommended speed during Autotune varies with type of boat, but should not exceed 10 knots. Autotune should not be performed at planing speed! For displacement boats use a speed that is about half the normal cruising speed (i.e. if cruising speed is about 10 knots, do the Autotune at about 5 knots). The parameter values calculated during this Autotune becomes the LO speed parameters. The HI speed parameters is automatically set to 66% of the LO speed parameters. It is recommended that the Autotune be done in an East or West direction if possible, as these will yield the best balanced parameters.

WARNING ! *The Autotune function will take control of the boat and perform a number of S-turns. It must always be performed in open waters with sufficient safe distance to other traffic. The Autotune function may take from 1 to 2 minutes to complete.*



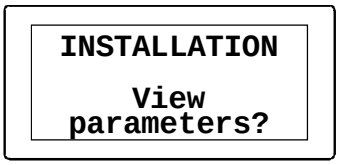
Activate the AUTOTUNE, by rotating the course selector clockwise.

After the Autotune has been completed the rudder must be controlled manually, as the mode is returned to STBY.

When the Autotune has been completed, there should normally be no need for further adjustments. On certain installations, however, you may want to "fine tune" the parameters after the Autotune due to the special steering characteristic of a specific boat. Viewing or changing the Autotune parameters are done from within the VIEW PARAMETERS menu item.

Exit the Seatrial Settings menu by pushing STBD [>] button to proceed to the View parameters menu, or press STBY to return to normal AP35 operation.

View parameters



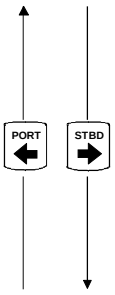
A boats steering parameters found by Autotune can be looked at and if needed changed under this menu item. The steering parameters can also be set to values manually instead of performing an Autotune. The parameters are divided into two sets:

- HI = Steering parameters for automatic steering at HI speed
- LO = Steering parameters for automatic steering at LO speed

The RUDDER value in WORK mode is shown as a separate item.

Manual parameter adjust

Use course dial to adjust parameters



Use PORT and STBD buttons to step through parameters

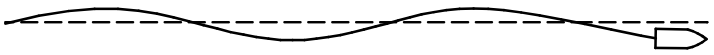
Displayed parameter	BOAT TYPE:		Own boat	
	Displacement	Planing	Autotune	Manual
LOw speed				
Rudder LO	0.5	0.3		
Cont Rudd LO	1.4	1.4		
Autotrim LO	40	40		
Rudder lim LO	20	20		
HIgh speed				
Rudder HI	0.35	0.2		
Cont Rudd HI	1	1		
Autotrim HI	40	40		
Rudder lim HI	20	20		
Rudder WORK	0.5	0.3		

Note !

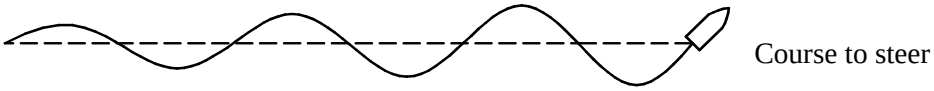
The values in the table are factory set and listed for information only. After having performed the Autotune, the values may differ from those listed in the table. It is recommended that you write down the parameters "learned" by the Autotune prior to making any adjustments.

The two most important parameters that determine the performance of the automatic steering are Rudder and Counter Rudder.

Rudder sets the rudder gain which is the ratio between the commanded angle and the heading error (P-factor).



Too little rudder

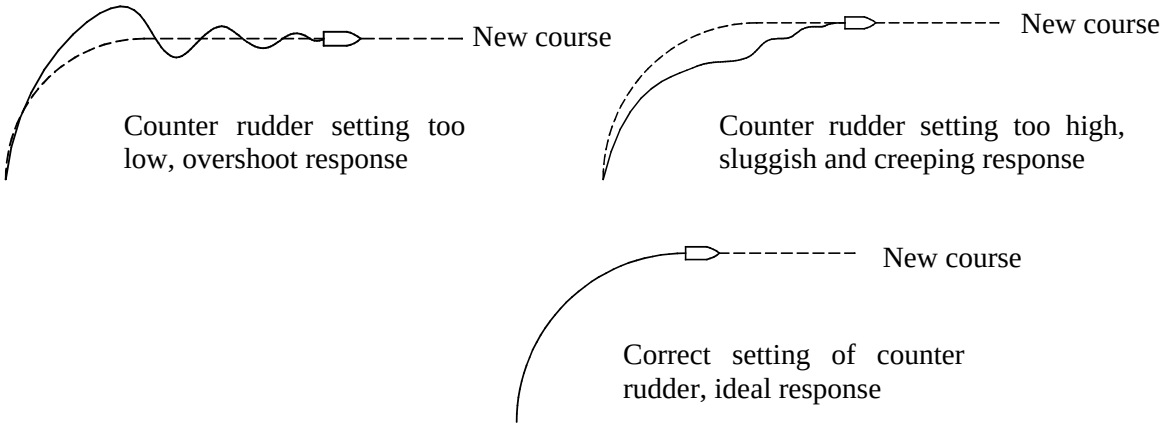


Too much rudder

- Too little Rudder and the autopilot fails to keep a steady course.
- Too much Rudder gives unstable steering and reduces speed.
- Low speed requires more rudder than high speed.

Counter Rudder is the parameter that counteracts the effect of the boats turn rate and inertia. For a short time period it is superimposed on the normal rudder response as provided by the Rudder parameter. It may sometimes appear as if it tends to make the rudder move to the wrong side (counter rudder).

The best way of checking the value of the Counter Rudder setting is when making turns. The s illustrates the effects off various Counter Rudder settings.


New course
Counter rudder setting too low, overshoot response
New course
Counter rudder setting too high, sluggish and creeping response
New course
Correct setting of counter rudder, ideal response

Autotrim standard value is 40 which should work well on most boats.

When the vessel has a constant heading error, due to external forces such as wind and current, the AUTOTRIM function takes account for this by building up a constant rudder offset. The time factor when the AUTOTRIM parameter is adjusted, is the time it takes to build up the rudder offset.

Rudder Limit determines the maximum rudder movement in degrees from midship position. It should be kept at 20 degrees unless there is a need for more rudder when performing dockside manoeuvres.

Caution ! ***In no event should the Rudder Limit be set to a value higher than the actual maximum rudder angle.***

4.35 Final sea trial

After having completed all settings in the Installation Settings Menu, take the boat out and perform a final sea trial in open waters with sufficient distance to other traffic.

- Steer the boat on all cardinal headings in AUTO mode.
- Start with low and medium speeds to get familiar with the response from the AP35.
- Try the effect of LO and HI speed settings.
- If the hardware for automatic HI/LO speed selection is connected and configured, verify that the HI/LO transition is occurring, and the HI/LO parameters are changing after the transition speed is crossed (by more than 1 Knot higher or lower speed).

- Try the Dodge function, the U-turn and the C-turn.
- If a Non-Follow Up lever (or handheld remote) is connected, test the mode switching and verify Port and Stbd steering commands of the lever.
- Set waypoints into each navigator connected to the system, and verify that the AP35 steers in NAV mode for each NAV source.
- Provide the owner with user training.

4.36 Providing user training

The user should be instructed in the "basic" operational functions, such as:

- Turning the system on and off
- Explain how to change modes (explain briefly what takes place in the different modes).
- Regaining manual control from any mode. Point out in what modes the helm is engaged by the autopilot (bypass/clutch).
- How to take command at an "inactive" station if applicable.
- Lock mode and how to lock/unlock and how to shut the system down from a locked control unit if applicable.
- Show NFU and FU steering and show the difference.
- Review how to use a NFU controller if connected.
- Course change by rotary knob and buttons.
- Go through the user SETUP menu and show how to (and why) change the settings.
- Also include Nav. source, Pos. source and Compass sensor selection if applicable.
- Show the owner where the compass (or compasses) is mounted and instruct him to keep magnetic items away.
- Show where the Mains circuit breaker is.

5 MAINTENANCE

5.1 Control unit

The AP35 Control Unit will under normal use require little maintenance as the cases are made from seawater resistant aluminium and has a polyester coating to withstand the rigours of an exposed cockpit.

If the unit requires any form of cleaning, use fresh water and a mild soap solution (not a detergent). It is important to avoid using chemical cleaners and hydrocarbons such as diesel, petrol etc.

Make sure that all open ROBNET connectors are fitted with a protection cap.

It is advisable at the start of each season to check all connections to the control unit head and cover with Vaseline or WD40. If the Control unit is not removed from the boat, it should be covered.

5.2 Junction Unit

No special maintenance is required. It is advisable, however, at the start of each season to make a visual inspection of the internal and check all connections.

5.3 Rudder Feedback

Make a visual inspection at 2-3 month intervals and at the start of each season. Apply some grease at the transmission link ball joints when required.

5.4 Compass

If the compass is exposed to the weather, make a visual inspection at 2-3 months intervals, and at the start of each season.

5.5 Drive unit

Refer to the drive unit manual for maintenance instructions.

5.6 Exchange of software programme

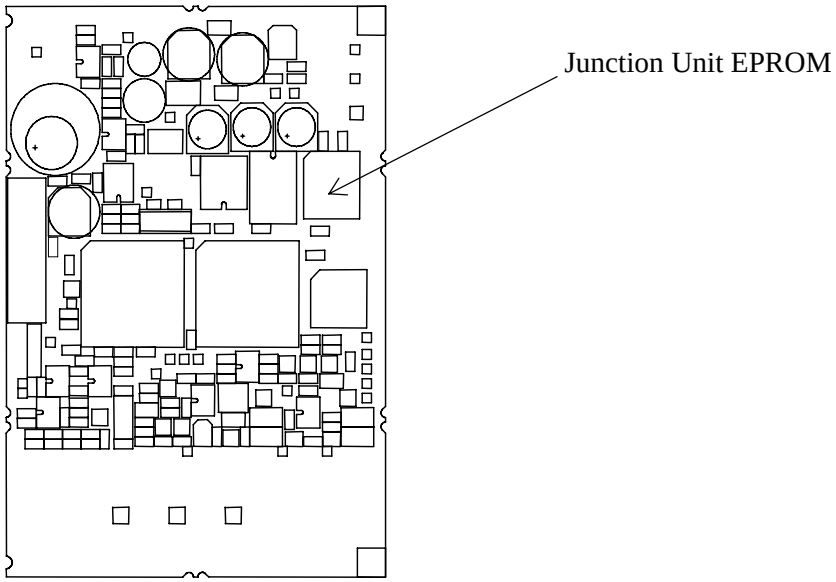


Figure 5-1
J3000X/J300X/J300X-40 Main PC-Board

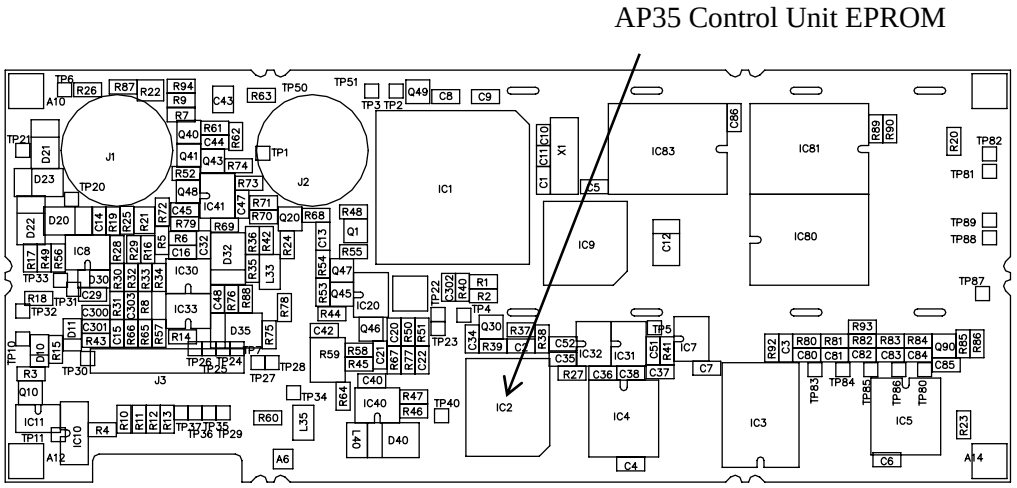
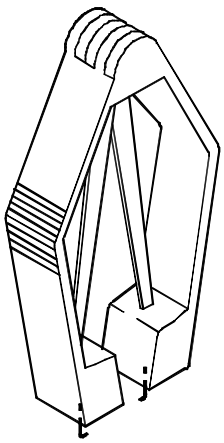
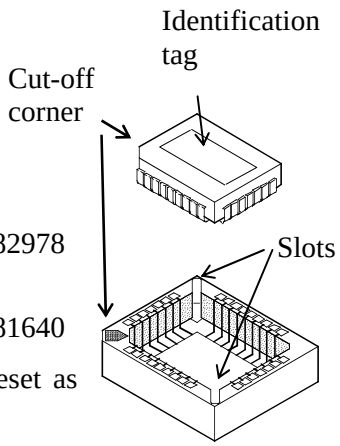


Figure 5-2 AP35 PCB, component layout

- Remove the EPROM from the socket by means of the special extraction tool (p/n 44139806)
- Insert the tool by pressing the two grip pins down into the two slots in the corners of the socket.
- Squeeze the tool and pull out the EPROM.
- When inserting new EPROMS, make sure the cut-off corner matches with the one in the socket. Press it gently into the socket.



- The identification tag indicates:
  - Name of unit
  - Simrad Egersund part number
  - Software version



Caution ! ***Make sure that the right EPROM is mounted in the actual unit.***

EPROM for AP35 Control Unit: P/N 22082978

EPROM for J300X, J300X-40 and J3000X Junction units: P/N 22081640

- After change of EPROM, perform a master reset as described on page 76.

Modification on AP35 PCB

Refer to our Technical bulletin no. 10/97. The modification is valid from PCB S/N 913 and onwards. Modified PCBs are not compatible with former S/N code ---A70 of the control unit. All AP35 Control Units from S/N 905A71 onwards have got modified PCBs, and accordingly they have got the new A71 code.

It is important to notice that PCBs with revision D are not compatible with PCBs having revision C or earlier. As a consequence the following must be observed:

1. Control units with S/N code A71 must have PCBs with revision D.
2. Control units with S/N code A70 must have PCBs with revision C or earlier.

6 TROUBLE SHOOTING

An autopilot is a complex system and the performance is dependent of a proper installation and a successful sea trial.

In the event of a failure, you will be helped by the AP35 software which contains several test features that will assist you in isolating a probable fault.

Audible and visual alarms are given in the event a fault is detected.

The audible alarm is reset by pressing any button (e.g. by changing mode from AUTO to STBY). The visual alarm will remain and alternate with the operating display until the fault has been rectified. Refer to the table below for hints and try to solve the problem yourself, or consult your nearest Simrad dealer for assistance.

Perform the repair action in the listed order.

6.1 Alarms

Display readout	**Probable fault**	**Recommended action**
System failure Alarms:		
Rudder feedback failure (autopilot operates on simulated feedback)	Rudder feedback signal missing or erratic	1. Check all connections. 2. Check the alignment as per the installation instructions 3. Replace rudder feedback unit.
Rudder response failure	No response to rudder command.	1. Check all connections 2. Check Rudder FB transm. link. 3. Check Drive unit motor/brushes. 4. Replace junction unit Power PCB.
Rudder test too slow	Excessive load on steering gear. Air in hydraulic system. Insufficient drive unit capacity.	1. Look for mechanical obstructions at the rudder/tiller/quadrant. Check the back drive force. 2. Bleed the hydraulic system. 3. Replace with bigger pump unit.
Rudder test failed	Following conditions may exist: a) Rudder feedback failure b) J3XX current overload c) Bypass/clutch overload	Refer to recommended actions for the specific probable faults.
	Rudder moves in one direction only a) Poor connection to one of the solenoids (continuously running pump) b) Faulty Power PCB in junction unit	a) Check connections b) Replace PCB

Display readout	Probable fault	Recommended action
Rudder test failed (cont'd)	Rudder test not completed within 2 min. a) Poor connections to drive unit b) Faulty Main PCB in junction unit c) Faulty Power PCB in junction unit	a) Check connections b) Replace PCB c) Check PCB for traces of burnt transistors. – Change PCB.
	Rudder moves at full speed to one side. a) Faulty Power PCB in junction unit	Replace PCB
Compass data missing	No data from selected compass.	1. If more that one compass is connected to the system, refer to the USER SETUP menu to select a different compass. 2. Check connections/Interface menu. 3. Replace compass PCB or interface PCB *(Note: Do not cut cables. The PCB contains screw terminals).*
Comm. failure active Control	Active control unit (including FU35) goes silent.	1. Press STBY button on "Inactive" unit to reset. 2. Check/repair Robnet cable. 3. Replace control unit/FU50 PCB.
J3XX current overload	Drive unit shut down due to excessive load or short circuit.	1. Check Drive unit/Drive unit installation/Manual steering/ Rudder 2. Disconnect Drive unit. If fault is still present, replace junction unit Power PCB.
Low 15 volt	Internal 15 Volt supply in Junction Unit below limit.	1. Replace junction unit Main PCB 2. Replace junction unit Power PCB if Mains voltage is 12V.

Display readout	Probable fault	Recommended action
Bypass/clutch overload	Clutch/bypass current exceeds 2,5 Amps (overload or short circuit).	1. Check actual current 2. Check voltage marking on coil 3. Check coil resistance (through connecting wires)
Bypass/clutch disengaged	Poor connection or open circuit in bypass/clutch coil	1. Check connections 2. Replace bypass/clutch if open. 3. Perform new "Rudder test".
J3XX high temp.	Excessive temperature in Junction Unit (>75°C), possible long term overload.	1. Switch off autopilot 2. Check for backload in Drive unit/ steering system. 3. Check that Junction unit specifications matches Drive unit.
Data failure J3XX	Wrong checksum on memory parameters or variables. Junction unit will use default values.	Perform a "Master reset" and make a new "Dockside set-up". Switch off and on again. If the alarm is repeated, replace Junction unit Main PCB.
Com. failure with J3XX	Junction Unit faulty or possible poor connections in Robnet cable from same.	1. Check Robnet connectors and cable. 2. Replace Junction unit Main PCB.
Low supply voltage	Mains voltage less than 9 Volts	1. Verify by System Data Menu 2. Switch autopilot off, charge batteries 3. Check/repair battery charger
High supply voltage	J300X, J300X-40 Mains exceeds 44 V J3000X Mains exceeds 29V	1. Verify by System Data Menu 2. Switch autopilot off 3. Check / repair battery charger
Alarms in AUTO, NAV or WORK:		
The boat is off course	Extreme weather conditions, too slow speed. Boats heading is outside fixed off course limit of 20 deg. (Automatic reset when inside limit.)	1. Check steering parameters (Rudder, Autotrim, Seastate-filter). 2. Increase Rudder value 3. Increase boat speed, if possible, or steer by hand. See also page 21
Alarms in NAV		
NAV. data failure	Missing or invalid NAV data.	1. Use NMEA Test Menu 2. Check Nav. receiver setup.

6.2 NMEA Test

The NMEA test menu is accessed from the User Set Up Menu (page 25). It provides you with status information of the different NMEA messages used in the system.

Decoding

The incoming signals are decoded according to a built in priority table.

Cross Track and bearing information is taken from the NMEA messages with highest priority.

One of the following codes will be displayed:

--- No data or no NMEA sentence containing the data needed at the input port.

OK Valid data found

INV Message with invalid information.

FRM Message has format failure such as

a) Incorrect check sum

b) Wrong contents in datafield(s)

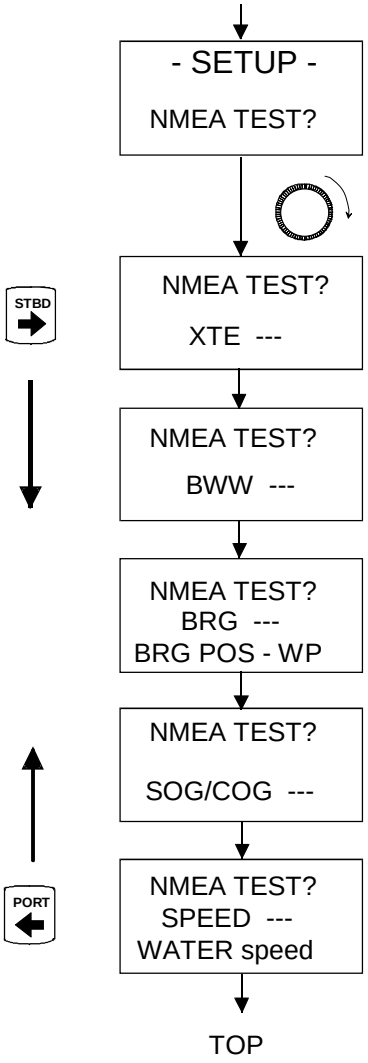
Check status and set up of data source.

NMEA signal monitor

Close to the NMEA terminals in the junction unit you will find a green LED. A flickering LED indicates that a NMEA signal is received. It does not, however, qualify the contents of the message.

NMEA hardware test

Refer to next page, System Data Menu.



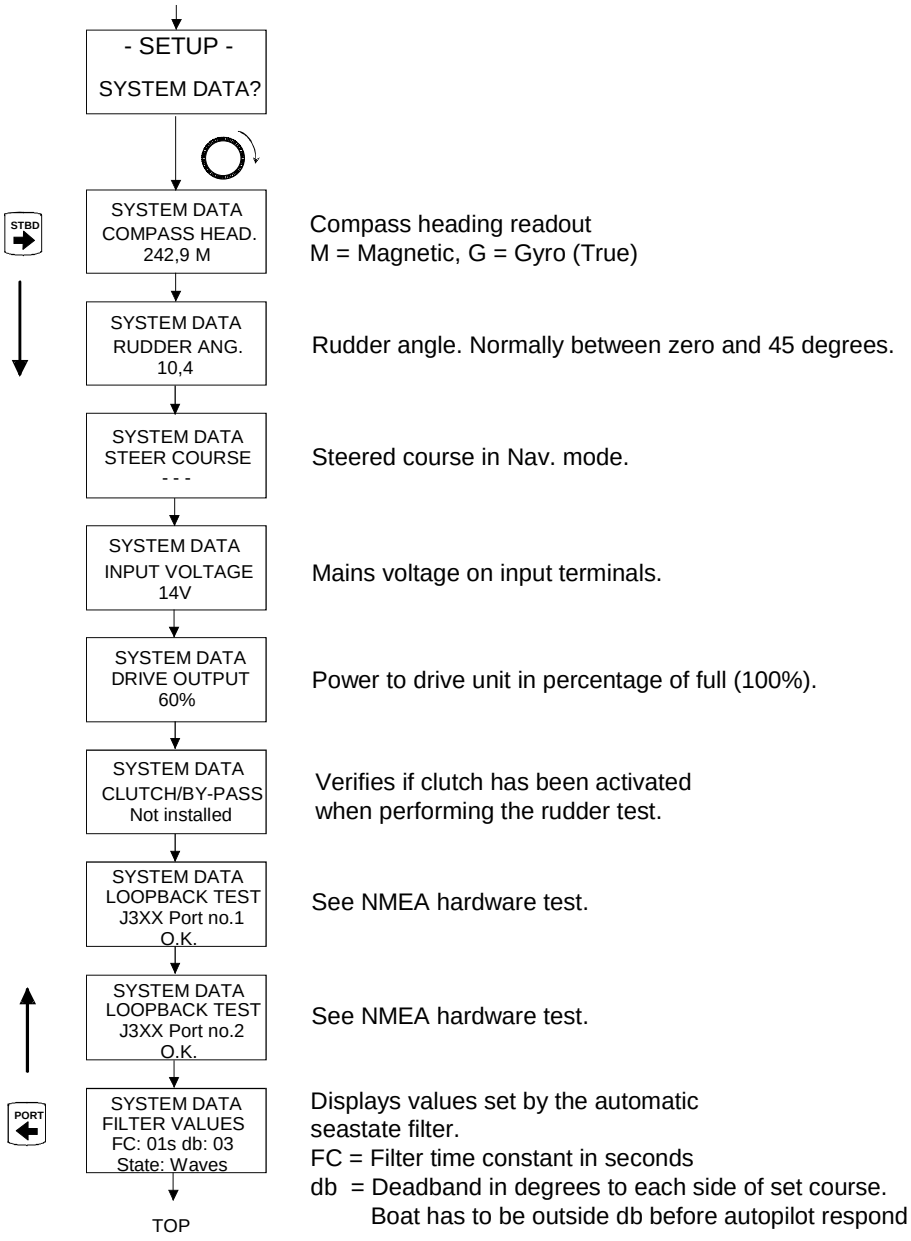
6.3 System Data Menu

The menu is accessed from the User Set up Menu (page 25). It provides you with additional system data that can be useful when testing or trouble shooting the system.

NMEA hardware test

On the Main PCB in the junction unit disconnect the cables and connect TX1+ to RX1+ and TX1- to RX1-. Similar on the Power PCB connect the NMEA ports the same way; TX2+ to RX2+ and TX2– to RX2– (not available on J3000X).

Select the Loopback test menu(s) and verify that the hardware is OK. If not, replace the corresponding PCB(s) to rectify.



7 SPARE PARTS LIST

22085104	**AP35 Control Unit**
22082945	AP35 Front Housing Ass’y
22082853	Back cover
22082895	AP35 Front Panel Keypad
22082804	AP35 Board Ass'y
22082978	PROM (programmed) V..R..
	Junction Units
22085120	J300X Junction unit
22085112	J3000X Junction unit
22085138	J300X-40 Junction unit
22081707	J300X Mounting accessories
22081855	J3000X Mounting accessories
22081962	J300X-40 Mounting accessories
22081251	J300X Power PCB Ass'y
22081715	J3000X Power PCB Ass'y
22081947	J300X-40 Power PCB Ass'y
22081285	J300X Main PCB Ass'y (All models)
22081640	PROM for all junction units
22081350	Main cover
22081368	Terminal cover
	RFC35 Electronic Fluxgate Compass
22086995	RFC35 Fluxgate Compass
22081178	RFC35 PCB Ass'y
	RC25 Rate compass
22084438	RC25 Rate Compass
22084370	RC25 PCB Ass'y
	RF300 Rudder Feedback Unit
20193744	RF300 Rudder Feedback
20193678	RF300 Transmission Lever Ass’y
20193454	RF300 Transmission Link Ass’y
20193624	RF300 Ball joint Ass'y (2)
	RF45X Rudder Feedback Unit
22011290	RF45X Rudder Feedback Unit
22011217	Mounting Kit
22011258	RF45X PCB Ass’y with Potentiometer
22011365	Potentiometer 10K (w/wires)

22011183	RF45 Transmission Link Ass’y
22011431	RF45 Ball Joint Ass’y
22504039	Transmission Lever
44156925	Junction Box (Hensel D1202)

NI300X NMEA Interface

22089536	NI300X NMEA Interface
22081913	NI300X PCB Ass'y
22081921	NI300X PROM V..R..

RI35 Mk2 Rudder Angle Indicator

22085146	RI35 Mk2 Rudder Angle Indicator
22084115	RI35 Mk2 Meter and Board Ass’y
22083968	RI35 Mk2 Front Panel
22084016	RI35 Mk2 Front Housing
22083992	RI35 Mk2 Back Cover

R3000X Remote

22022446	R3000x Remote Control
20184552	R2500 Mounting Kit
20184545	R2500 PCB Ass'y
20184578	R2500 Cable
20184586	R2500 Front Housing
22022396	R3000x Front Panel

S35 NFU Stering Lever

23241227	S35 Steering Lever w/accessories
23241144	S35 PCB Assy
23241250	Button & Cover
23241243	S35 Service Kit (Spring, switch, seal)
23240054	Handle

Robnet cables and connectors

22081145	Robnet cable 15 m (49'') with one male connector
20191607	Robnet cable 7m (23') with male connectors
20191615	Robnet cable 15m (49') with male connectors
20192266	Robnet extension cable 10m (33') with male and female connector
44138048	Robnet cable (bulk)
22082697	Male connector. Pins are crimp type but solderable.
22082705	Female connector (for extension cable only). Pins are crimp type but solderable

	Tools
44139707	Key for Lock ring on Robnet receptacles
44139806	Extraction tool for PROM
44161792	Robnet pin extraction tool (for crimp type connectors)
22088595	Programming kit RS232